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Marshal of the Royal Air Force
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Chief of the Air Staff, 1919-1929.

MARSHAL OF THE ROYAL AIR FORCE SIR HUGH M. TRENCHARD, Bart., G.C.B., D.S.O., D.C.L., LL.D.

Of him to whom we come to bid good-bye
Let this be spoken, venturers of the sky!

He was a man who grimly sought
The best in everything he wrought,
And what his inward vision saw
He followed as the sternest law:
Nothing was good that might be better
In man or scheme or carburettor
So that the Service might be built
On rock enduring, not on silt.
He knew one standard, one high test—
The heart's utmost and the brain's best.

Behind that glance, austere and keen,
That slightly terrifying mien,
Seeming upon inspection days
More apt to criticize than praise,
There lurked, despite his august rôle,
The twinkle of a human soul
That might not doff its mask and shine
With beams congenial and benign.
And (may one guess?) he gladly sought
That man whose knees were firm and taut,
Who stood his ground and spoke his mind
And did not bow before the wind.

He was, since we must needs be brief,
A staunch and most courageous Chief
Who finely won but simply bore
Honour in peace, honour in war.
Of him it may be fairly said
He shaped, inspired and wisely led
With steadfast faith that never swerved
The Service that he loved and served.

Of him to whom we now must say good-bye
Let that be spoken, venturers of the sky!

C. L. M.

SERVICE IN THE ROYAL AIR FORCE

By Air Vice-Marshal Sir Philip Game, G.B.E., K.C.B., D.S.O. (Retd.).

The Editor has done me the honour of asking me to contribute an article to the first number of the Air Force Quarterly on the subject of service in the Royal Air Force. I assume that his hope is to interest the non-Service reader, since there is little to be said which would be news to the members of the Force who experience its joys and sorrows daily in their own persons.

On this assumption, I will not apologize for beginning with the statement that the Royal Air Force is a third and independent fighting Service.

It seems curious to have to say this, seeing that the institution of the Royal Air Force as a Service separate from the Army and Navy dates from April, 1918, but we still constantly find that it is not realized.

Before dealing with service in the Force, it may not be out of place to explain how to enter it. This can most conveniently be done under the headings of:—

(*a*) Permanent officers.
(*b*) Short-service officers.
(*c*) Other ranks.

Permanent Commissions.

The permanent officer enters through the Royal Air Force College at Cranwell in Lincolnshire, an institution similar to the well-known Royal Military Academy at Woolwich, Royal Military College at Sandhurst, and Royal Naval College at Dartmouth.

Here he is given a two-years' intensive course, practical and theoretical. While Service subjects naturally predominate, the general aim is not to turn the cadet into an aeronautical engineer, which obviously could not be done in the time, but to give him a sound foundation on which to build subsequently.

Somewhat of a novelty perhaps at a Service college is the inclusion of English and English literature with a view to stimulating interest and improving power of expression. From the lack of the latter we of an older Service generation have often suffered. We want to avoid

the criticism once passed on a similar establishment, namely, that it gave the best possible training and the worst possible education.

Last, but by no means least, the cadet is taught to fly.

A permanent commission can also be obtained from the universities on much the same lines as an Army commission. In this case, the officer gets his Service training at a Flying Training School, after joining the Service, though he is now able at Oxford or Cambridge to do much of his ground training and to learn to fly by joining the University Air Squadron.

Short-Service Commissions.

The short-service commission is a new departure and consequently requires perhaps somewhat fuller treatment.

I believe I am correct in saying that in every Air Force in every country a non-permanent body of pilots has proved necessary. Working backwards from the higher appointments, it is obvious that, if a permanent career is to be open to every permanent officer, the number of entrants on a permanent commission must be limited. Moreover, aviation, especially military aviation, is a rapidly developing science. Energy, keenness and the power to absorb new ideas are essential in the higher ranks, and these, broadly speaking, are the attributes of comparative youth. An Air Force, if it is to give its full value, must therefore be young. Stagnation in promotion can only result in the senior officers being too old for their jobs.

The permanent officer cadre of the Royal Air Force has therefore been strictly limited to such numbers as will, on an actuarial basis, throw open a career to all and prevent undue senility in the higher ranks. But this number does not provide the officers required, nor—a more important consideration—does it create any reserve of pilots in case of war. Casualties, however, begin at once, and nearly 100 per cent. of them are among the pilots.

A system of early retirement of a proportion of officers in middle rank, such as exists in the Navy, might provide the officers required in peace, but would not meet the needs of mobilization when a reserve of officers of the junior ranks is what is needed.

The problem has been solved by the short-service commission for five years with the Regular Air Force and four years, which may be extended, in its reserve. From the Service point of view, this meets the two essential requirements. It provides the officers in peace and the first reserve on mobilization. It has the further advantage of enabling the permanent cadre to be kept up to establishment and reinforced by the selection of a few short-service officers as required for permanent commissions, chosen from a large number who are known and have been tried.

The short-service officer receives pay and allowances identical with those of the permanent officer, and in addition a gratuity of £75 per year of service payable at the termination of his five years' regular service, and designed as a nest-egg to help him to re-enter civil life.

A small percentage of short-service officers are allowed to extend their regular service to ten years, receiving a higher gratuity for each year beyond the fifth, with a maximum of £1,000 on completion of ten years. This was found necessary to produce the required number of Flight-Lieutenants (equivalent to Captain in the Army). The number of officers of this and indeed of each rank on the permanent list is, of course, limited by its total numbers, and the permanent Flight-Lieutenants would, it soon became apparent, not meet the needs.

The system has been criticized from the individual's point of view. The short-service officer leaving the Service at, say, 25 to 28, would, it was said, find great difficulty in re-entering civil life, and would have little or no training or knowledge of a commercial value. Against this it may be urged that character tends more and more to have a commercial value, and that the short-service officer will have seen something of the world, learnt to command, experienced the value of discipline, and, if he chooses to take advantage of his educational opportunities, both practical and theoretical, should have acquired a good grounding of technical knowledge and ability in one direction or another.

Anyhow, the gloomy prognostications of the critics have not been fulfilled. The Air Ministry obviously cannot guarantee employment in civil life, but, in addition to recognizing some degree of moral responsibility towards its short-service officers, it has the compelling motive of self-interest to do all in its power to make the system a success.

Here an apparent digression is necessary. Education in the Royal Air Force, both for officers and men, is carried out by a body of civilian graduated teachers, of whom one at least is available on every station. The short-service officer can, therefore, always obtain assistance in any studies he may wish to undertake against his return to civil life. The system also works in the opposite direction in that the education officer gets to know the capabilities of the short-service officers on his station.

These considerations and an early experiment by an individual education officer in the direction of placing short-service officers in civil employment led to a more ambitious scheme, and there is now in the Ministry something in the nature of an Appointments Board at a university, with an education officer as secretary, who keeps in touch with employers all over the country, and offers his services to short-

service officers whose period of regular service is shortly to expire. Thanks to the patriotism of employers, the scheme had a good start and the short-service officer himself and his service training have, it appears, " delivered the goods." Many firms have asked for more, which is after all the best proof, and I have been told lately that there is now a difficulty in filling the vacancies offered.

The short-service officer is selected by personal interview without examination, and obtains his training of ten months at a Flying Training School where, in addition to learning to fly, he is taught the rudiments of military aviation, and learns his duties as an officer.

Leaving aside for the moment the non-commissioned officer pilots —who are dealt with below—there is one other source of officer pilots, namely, by means of attachment for varying periods from the Army and Navy. Originally it was hoped to obtain a fair proportion of non-permanent officers in this way, one advantage being that it would ensure a knowledge of the uses and limitations of the air arm among the future commanders of the older Services. Various difficulties have been met with in practice. The Army finds it hard to spare the officers in peace, and requires their services on mobilization, thereby depleting the Royal Air Force reserve, while attached naval officers are practically confined to the Fleet Air Arm afloat. One may perhaps hazard a guess that the final word on the subject has not yet been spoken.

Stores Accountant and Medical Branches.

Apart from its flying branch, the Royal Air Force has its own stores accountant and medical branches. The two former are filled by examination from candidates who can show previous business and accountancy experience respectively. The medical branch is principally filled by selection on a short-service basis, the permanent cadre, about 50 per cent. of the whole, being staffed by selection from among the short-service officers.

Prospects of Promotion.

One may perhaps conclude with a few words on a subject of great interest in all professions—namely, promotion.

The ideal system of promotion is probably one of the insoluble problems of humanity. At all events, it has not hitherto been discovered as far as I know. Its general aim might, I suppose, be defined as offering reasonable prospects of promotion to all, while bringing the outstanding to the top.

The diversity of attainments required in the Royal Air Force adds to the complications of the problem. The brilliant pilot, the expert

engineer, the wireless magician, the photographer, and many others are all needed and all must have reasonably equal chances of promotion.

For many reasons which are too long to enter into here, the Royal Air Force has made it a *sine qua non* that all members of its flying branch, which includes its technical experts, must fly. Only pilots, therefore, are considered in its general scheme of promotion, non-pilots and the non-flying branches being dealt with under separate rules.

In the flying branch, an endeavour has been made to fulfil the aims defined above by a combination of seniority and selection. Pure selection rules in the higher ranks where numbers are manageable and individuals and their records are comparatively well known. Pure selection was adopted in the lower ranks also during the first few years of the Force's existence as a separate entity. This was partly to straighten out the many anomalies resulting from the rapid formation of the Force in time of war, and partly as an experiment. But time showed that it was not practicable and must inevitably result in a larger and larger collection of fixtures at the top of each rank, not because they were not fit for promotion, but because there were always some more brilliant youngsters below them who got promoted over their heads.

Promotion purely by seniority was ruled out as obviously unsuitable for a highly active and technical service which requires comparatively young leaders.

The eventual solution was seniority tempered by ante-dates which count for promotion only and make no difference in an officer's seniority in his existing rank.

These ante-dates of various periods up to two years as a maximum are earned automatically by successful qualification in the various technical subjects such as engineering, wireless and the like, for proficiency in foreign languages and for graduating at the Staff College or as a Flying Instructor.

Further, to ensure that the really brilliant pilot does not get left behind, even if he does not aspire to any of these attainments, each air officer commanding is allowed to recommend so many months' ante-date in all, according to the number of officers under his command, quite apart from the automatically earned ante-date. The limit of recommended ante-date is three years, and of recommended and automatic ante-date combined four years.

Aircraft Apprentices.

In its other ranks, the Royal Air Force requires over 60 per cent. of skilled tradesmen of very various trades. Peace experience soon showed that first-class skilled men would not be forthcoming in any-

thing like the numbers required and that consequently the Air Force must train its own. As long ago as 1919, therefore, a system of boy training was instituted. Advantage was taken of the educational system of the country, and the main source of entry is by the nomination of boys of 15 to 16½ by the local education authorities all over the kingdom. Selection among nominees is by competitive examination with a qualifying minimum, and those successful join the School of Technical Training at Halton in Buckinghamshire as Aircraft Apprentices. This source of entry is supplemented by open examination by the Civil Service Commissioners, and by the direct entry, on reaching the qualifying standard, of the sons of fathers who have served in His Majesty's Fighting Forces.

The course at Halton lasts three years, during which the Aircraft Apprentices continue their general education under civilian education officers, and are taught their trade by serving and ex-Service instructors. As nearly 1,000 skilled men are required annually, there are upwards of 3,000 in residence, and Halton is probably the largest school of its kind in the world. The estate formerly belonged to the late Mr. Alfred Rothschild, and the beautiful park and surrounding meadowland provide adequate playing grounds for the whole of the school. Magnificently equipped workshops exist, built during the war, and the barracks, commenced in 1919, are the most up-to-date in England. Halton will repay a visit from anyone interested in a large-scale educational experiment, though it may claim by now to have passed the experimental stage.

A similar technical school for men of the wireless trade, though on a far smaller scale, exists at Cranwell.

Skilled men in trades in which a few only are required and unskilled men are obtained by ordinary direct enlistment.

One or two points in connection with the prospects of the airman deserve mention.

Aircraft Apprentices are entered every six months to the number of about 500. From each batch passing out of the schools at Halton and Cranwell, six are selected for cadetships from among those highest on the list. These six proceed to Cranwell College, where they are given the ordinary two-years' course free of any expense, and, on passing out successfully, are granted commissions.

Non-Commissioned-Officer Pilots.

Ex-Aircraft Apprentices and directly enlisted men of certain trades have also the privilege of volunteering for training as non-commissioned-officer pilots, of whom there are at present between three and four hundred in the Royal Air Force. On completion of training, these men are promoted to the rank of Sergeant. Normally, they

continue as pilots for five years, though in exceptional cases this may be extended. Subsequently they revert to their trade, but remain on the flying reserve, for which they receive a retaining fee and are kept in flying practice.

Sergeant-pilots are eligible for selection for a permanent commission, a few of which are awarded annually.

A Life Full of Professional Interest.

And now to justify the title of this article. What has service in the Royal Air Force to offer? From the prosaic but important aspect of a living, it does not lead to riches except in the case of the favoured few who become so expert technically as to obtain a fat billet in an armament firm. But it does offer to the careful a living wage from the commencement, a fair income in middle life, and a reasonable pension.

To the ardent youngster who wants to see the world in a novel and romantic guise the Royal Air Force offers far more. This is a mechanical age, an age of ever-increasing speed, and an age of rapid scientific development, and where can the rising generation enjoy all these to anything like the same extent as in the Royal Air Force? If we go back twenty-five years, the aeroplane had not evolved. If we go back fifteen years, 80 miles an hour was about the limit with an engine of about 100 horse-power. We have lately seen flight at nearly 360 miles per hour, and have engines of 600 horse-power and more, and it would be a bold man who would forecast the developments of the next quarter of a century.

Then, again, there is the exhilaration of flight, the superiority complex, as it were, of seeing the little motor-cars and railway trains crawling along below one, confined to their roads or rails, while oneself enjoying extreme speed and perfect freedom in all three dimensions.

What a wonderful capacity to see the world is conferred, too, by the aeroplane! Read Sir Philip Sassoon's account of his flight to Egypt, the Sudan, Palestine, Iraq, and India, and you will be verily astonished by all he saw of ancient splendour and modern activities in a few weeks' trip by air. The North-West Frontier of India, that strip of age-long romance, invasion and raid since—and, for that matter, before—Alexander the Great, can be traversed in a few hours, and a bird's-eye view obtained which goes far towards a realization of its problems, their importance and their interest.

Iraq, Palestine, Egypt and the Sudan, with their wealth of archæological and historical interest, are easily explorable by aeroplane. The Royal Air Force serve in all these countries, and in Iraq and Palestine the interest is enhanced by the responsibility for internal security and external defence.

[R.A.F. Official: Crown Copyright Reserved

Aden. A Flight of Fairey III Fs.

Then, unless there should be monotony, there are the long-distance flights with all their interest and experience, such as those from Cairo to the Cape and Nigeria, the Far East flight from England to Australia and Hong-Kong, the direct flight to India without a stop, and a host of lesser flights.

The R.A.F. also offers attractions to the lover of the sea. Flying boats, capable of a wide range of action on their own resources, are now stationed in the Persian Gulf and at Singapore, as well as in the British Isles, while the Fleet Air Arm, of course, shares the ubiquity and instant readiness for action of the Royal Navy.

Sport.

Apart from the interest of the Service itself and of the countries in which it operates, the wide distribution of the force offers facilities for all and every kind of sport. Hunting at home; big and small-game and mountain shooting in India; snipe, duck and woodcock shooting in Iraq, Palestine, and Malaya; shooting of all kinds in Africa; and fishing in many waters, not forgetting the big tarpon-like monsters of the Persian Gulf. Add to these pig-sticking in India—that sport of kings—and, of course, every kind of game from polo to ping-pong.

Such is life in the Royal Air Force—a life full of professional interest, in a Service which is continually developing on the scientific side, constantly being given new responsibilities, and finding itself up against novel problems, administrative, technical and military, which offer scope to any and every taste.

One other word. The Royal Air Force motto is "Per ardua ad Astra," and it tries to live up to it.

SOME NOTES ON PREPARING FOR THE STAFF COLLEGE

BY SQUADRON-LEADER R. GRAHAM, D.S.O., D.S.C., D.F.C., *p.s.a.*

INTRODUCTION.

THESE notes are written with the object of assisting officers who wish to make the most of the Staff College Course. They are intended primarily for those who have plenty of time in which to prepare, but it is hoped that they may be of use to those who are taking the Qualifying Examination in the near future. The subject-matter is derived from the experiences of many officers who have passed through the Staff College. The suggestions are by no means infallible, and every candidate should adapt them to suit his particular needs. The candidate who is in a position to obtain expert advice and assistance may find little of interest in this article, but it is intended primarily for the average officer who wishes to prepare himself unaided. If the article assists even a few officers it will have achieved its purpose.

I.

NECESSITY FOR SYSTEMATIC AND COMPREHENSIVE PREPARATION OVER A LONG PERIOD.

There is no stond or impediment in the wit, but may be wrought out by fit studies, like as diseases of the body may have appropriate exercises. —FRANCIS BACON.

It seems that in the past candidates have wasted valuable time through concentrating solely upon the Qualifying Examination, and in some instances a further loss of time has resulted through cramming without method. Some form of special study for the examination will always be necessary. However, the candidate who organizes his preparation on the broadest lines from the day he joins the Service will gain considerable advantage over the candidate who does not make up his mind about the Staff College until he is approaching the age limit. The former will have a better grounding and more experience than the latter in matters that go to make an efficient Staff Officer.

If attention is directed solely to the Qualifying Examination there is a tendency to cram knowledge by obtaining and learning by heart masses of detail and prepared answers to questions likely to be set. Whilst this practice may enable the candidate to pass the examination, it will not be of much value to him for the course. At the best he will be little better than a talking parrot, and the details and answers will soon fade from his memory. What is required of a candidate is the power to form and express opinions on problems, such opinions

being based on a knowledge of the causes governing such problems. Leaving out the genius, this power can be obtained only through careful and prolonged preparation; it cannot be cultivated in a few months' cramming.

The value to be derived from the Staff College Course will vary in direct proportion to the degree of preparation. In order to obtain the maximum value from the course, every candidate should broaden his mind beyond the scope laid down for the Qualifying Examination, which should be regarded as an indication of the minimum standard of knowledge required in order to pass into the Staff College. The mind can be broadened only by systematic study over a period of years, embracing not merely the syllabus for the examination, but also the syllabus for the course. Only thus will an officer be able to prepare efficiently for the Staff College and employment on the Staff.

The following extract from the Official Report on the Qualifying Examination held in September, 1926, confirms the views expressed above, and emphasizes the importance of constant practice in formulating opinions and committing them to paper:—

"The principal object of this examination is to find out whether they (the candidates) have the attributes necessary for the making of a Staff Officer. Each Examiner has this object before him when correcting papers. Strategy, Organization, or any of the other subjects are considered from this aspect, and the Examiner requires something more than a mere knowledge of facts. He wants to find the candidate who can show the correct relation between facts, can make sound deductions and produce his ideas in logical sequence and concise form. Candidates must therefore practise thinking over what they read in such a way that reading becomes a means of originating thought. They should then form the habit of expressing these thoughts in writing, because an idea which may seem fairly clear when thought about, often becomes extremely illusive when an attempt is made to transfer it to paper. The effort of trying to express, concisely, arguments on paper, is the surest way of fixing the salient points clearly in one's mind."

What is Required of a Staff Officer.

A man is but what he knoweth.—Francis Bacon.

In order to appreciate the scope of the preparation desirable for the Staff College it will be necessary first to consider what is required of a Staff Officer. An officer who decides to become a Staff Officer must be quite certain that he knows what the duties entail, and he must have his heart in the work. The qualities that go to make a good Staff Officer have been summarized in various journals from time to time, and quite recently the responsibilities of a Staff Officer have been

clearly outlined in Vol. II of the Royal Air Force War Manual. Whilst there are many differences between the Staff work of the three Services, the qualities of a good Staff Officer remain the same in all three.

The official Manual indicates that the Staff Officer has a dual responsibility. Not only must he assist the Commander to execute the functions of command, but he must assist the forces to execute the tasks allotted to them. It states that the relations between Staff Officers must be close and inspired by a desire to help one another, and this feeling must be extended to the forces within the command. The Manual shows that a Staff Officer must exercise foresight in anticipating difficulties and forecasting requirements in material needs to carry out the orders of the Commander. Finally, it states, with certain reservations, that a Staff Officer should offer advice to his Commander.

From the foregoing it is clear that a Staff Officer must possess the ability to think clearly, and to convey those thoughts accurately and concisely to others; in fact, he may be called upon to carry out the more difficult task of putting the thoughts of others into writing. It is this aspect of a Staff Officer's qualities that forms the basis of this paper, and therefore it will be dealt with in greater detail when the question of preparation is reviewed.

In a lecture on the modern Staff Officer, delivered at the Royal United Service Institution in January, 1928, Major-General Sir W. E. Ironside—" a past master in Staff work, and one who can improvise and make the best of the material at hand "*—emphasized the assumption of responsibility and improvisation as the principal attributes of a good Staff Officer. He stated that a Staff Officer must be able to assume responsibility in the absence of his Commander, and to act just as if his Commander were there. This implies knowing what his Commander would do were he there. Whatever happens, there must be continuity, and usually the Staff are the only people who can ensure it. Sooner or later continuity will demand the exercise of the Anglo-Saxon genius for improvisations, which Major-General Ironside considers of primary importance to the British Staff Officer, who never knows what he may be called upon to do. The lot of a Staff Officer is unique in this matter of improvisation, which must be based on knowledge and an analytical mind. In this connection, the lessons to be learnt from the American Civil War are outstanding.

In his personal qualities, a Staff Officer must be loyal. Loyal to his Commander and to the forces within the command, that is, loyal to the Service. Sir Ian Hamilton's loyalty to Lord Kitchener during the Gallipoli campaign is worth close study. Should a Com-

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* Admiral of the Fleet Sir Charles Madden, Bart., etc., in the discussion after the Lecture. R.U.S.I. Journal, Vol. LXXIII, p. 447.

mander allow his loyalty to fetter his judgment? Yet, a Staff Officer, having presented his views, must abide by the decision of his Commander. That is loyalty in another form, but loyalty all the same. A Staff Officer may find that his many responsibilities result in conflicting demands on his loyalty, and then, as in other matters, he must use his judgment.

Judgment is the ability to choose the better course and reject the worse, and to know why. It is wisdom rather than knowledge, and is based on common sense, which, to a large extent, is the outcome of experience. Practical experience in vital military matters is difficult to obtain in times of peace, and an officer must rely largely on the written word. Experience must thus be obtained from reading and writing. Reading is the most important part of a Staff Officer's education, and forms the basis of preparation for the Staff College. Sound judgment leads to sound decisions, but most decisions require to be enforced, and for this, as for other matters, a Staff Officer requires tact.

Tact requires no emphasis since it is obvious that any person with a dual responsibility, who is in constant touch with others, must possess it. Yet this essential quality is often absent. It is such a personal quality that it can hardly be taught. For this reason it should be an important consideration when selecting officers for the Staff. Much has been written about tact, and yet, every day, lack of tact, in one form or another, is the predominating difficulty in inter-Service relations. But tact must not over-ride the assumption of responsibility. There must not be any confusion between the two in the mind of a Staff Officer. The need for sound judgment again becomes apparent.

Finally, a Staff Officer must possess professional knowledge and common sense. These two attributes necessarily overshadow all others, but professional knowledge should not occupy the mind to the exclusion of the broader issues of an officer's education. There is a distinct danger of this happening in the Royal Air Force to-day. The pressure of routine work has been such that officers have had little time or incentive to broaden their outlook beyond the narrow confines of their immediate Service surroundings. This has been aptly described by a writer in a contemporary Royal Air Force journal as the monastic mind. The usual criticism that the outlook of the fighting Services is narrow is probably more true of the Royal Air Force to-day than it is of either of the two senior Services. Fortunately the time has now come when opportunities can be made, and these should increase with time, to follow wider interests. In this connection, the Staff College candidate of the future will have a distinct advantage over the candidate of the past. He will be in a position to

plan his career at a relatively earlier date, a possibility that presented itself only to the most far-seeing of those who served through the war of 1914-18. The responsibility for taking advantage of such opportunities must naturally rest with the individual. The few who have seized their chances are witnesses to the importance of systematic and comprehensive preparation over a long period, with an aim always clearly before them.

So much for the chief attributes of a good Staff Officer. He must think clearly and convey those thoughts accurately and concisely to others. He must assume responsibility at the appropriate time and be capable of improvisation when it is desirable. He must possess loyalty, judgment, tact, and, overshadowing all, professional knowledge and common sense. There are other attributes, such as a knowledge of human nature, cheerfulness, confidence, discretion—in fact, all the qualities that go to make a good officer, only they must be developed to a higher degree in a Staff Officer. Candidates for the Staff College should leave no stone unturned in an endeavour to cultivate all the attributes outlined above. These attributes are an essential part of the equipment of every officer, whether he is studying for the Staff College or not. The principles remain the same for all officers.

Need for Guidance and Assistance in Preparation.

I have given the rule, where a man cannot fitly play his own part; if he have not a friend, he may quit the stage.—Francis Bacon.

Within reason, a Staff Officer's range of knowledge cannot be too great, and some assistance in seeking and assimilating knowledge is essential. Few people are capable of educating themselves, especially when time is an important factor. Officers preparing for the Staff College should therefore obtain assistance, if only to avoid wasting time and energy. A tutor is not necessary, though he is useful for general subjects such as history, political economy, economics, principles of business organization and administration, and languages, which are not easily studied in conjunction with normal routine. The application of the lessons to be drawn from these subjects is a matter of professional knowledge and common sense. The cultivation of these qualifications rests entirely in the hands of individual officers. Usually it should be sufficient to work with other officers, principally to get another point of view but also to provide a means of discussing a problem. Discussion is invaluable, and may often be more profitable than written criticism. The essence of efficient preparation is to develop one's own mind and not merely to assimilate the opinions of others. Each officer should therefore think out the problem for himself and express his own views, preferably on paper, before getting

another opinion. In some instances, it may be necessary to enlist the aid of a specialist for grammar, composition, and specialist subjects. In this connection, the services of the Educational Branch and the specialists within the Service should not be overlooked.

The Necessity for Methodical Preparation.

The work of preparation for the Staff College falls broadly under three heads—reading, writing, and thinking. It should extend over the whole of an officer's career. Though the amount of time spent in preparation is important, little will be achieved without method. An officer must organize his time to his best advantage. It is not sufficient to organize it on broad lines; a detailed programme must be prepared beforehand, and adhered to throughout. Every week should show a definite advance in an officer's capabilities.

The detailed allotment of time must be flexible, but an officer should aim at studying for a definite number of hours each week. Those who have little time in which to prepare must necessarily allot more hours a week to study than those who make an early start. In either case, it is advisable to increase the work for a year or eighteen months before taking the Qualifying Examination. During such a period, the Examination Syllabus should be taken as the guide for study. The more thorough the ground-work during an officer's career, the easier the final preparation for the examination.

Time must be the first consideration in any programme of work. The allotment of time will vary with the individual. In principle it should be allotted between the various subjects on the basis of their relative importance in the Staff College Syllabus of instruction, professional knowledge being allotted the lion's share. When within a year of the Qualifying Examination the allotment of time should be adjusted to conform to the mark-value of the papers as outlined in Air Ministry Weekly Orders. When cramming for the examination, a candidate is apt to spend too much time on a subject that interests him most, whereas he should aim at a safe margin in all subjects. The time for study should be allotted on a weekly basis, and should be modified at frequent intervals as progress is made. The time spent on the various subjects should be ticked off each day to ensure that the total at the end of the week corresponds to the allotted figure.

About time, there is one point of particular importance concerning the examination itself. The proper distribution of time to the number of questions to be answered is all-important. The time allowed for each paper should be allotted in proportion to the mark-value of the questions to be answered. For example: the paper on History and Geography may be three hours for five questions of one hundred marks each, making a total of five hundred marks for the

paper; thus no one question should be given more than thirty-six minutes. When the mark-value varies for each question, the allotment of time must be varied in proportion. This allotment of time must be calculated at the beginning of each paper, and must be strictly followed. To do this, a candidate should, in the first place, read the paper through carefully, then select the questions to be answered; number them, allot a time to each, and finally deal with them according to the time-table. Prospective candidates will find a valuable guide for future examinations in the Examiner's remarks contained in the Annual Reports on the Qualifying Examination. In one of these reports, the Director of Organization and Staff Duties stated:—

> "It cannot be too strongly impressed on candidates that it is essential for them to be able to present their thoughts clearly and concisely to the examiner. To do this they must have their ideas and the points they wish to make, formulated before they start to write. They must be able to write down those ideas in a logical sequence, and finally—a point of great importance—the composition, the writing and the spelling must be such as to allow the examiner both to read and understand what is intended."

These remarks should be borne in mind by all officers preparing for employment on the Staff, because they apply with equal force to Staff duties, in which the Commander, or the forces in the Command, take the place of the Examiner.

Having dealt with this question of time, the next point for consideration is a record of the work done. The record must be in a form that will facilitate reference and therefore it must be indexed. Note-books and a card-index make the best combination. They may be supplemented by Press cuttings, which must be suitably filed. It is advisable to have a note-book for each subject. It should seldom be necessary to copy out articles and papers; a precis should suffice. Apart from reducing the amount to be recorded, a precis gives good practice in writing, and fixes the facts and arguments in one's memory better than any other method.

The card-index should form a complete record of the notes and Press cuttings, as well as of interesting points in articles and books when these have not been recorded in the notes. To facilitate reference, it is desirable to index points under more than one heading if this can be done reasonably. In principle, three entries should be the maximum for one point. To be of value, the index must be kept up-to-date.

The programme of work and the record of work are merely mechanical aids to methodical preparation. They will be of little use unless they are supported by consistent study and general orderliness.

END OF PART I.

(To be continued.)

AN ANALYSIS OF LEADERSHIP

By Major K. M. Loch, M.C., R.A.

We have it on the best authority that we should read and reread the lives of the great captains. Were this merely for our general interest, the recommendation would be fully justified. Despite the modern school of Socialistic historians, it is the great leaders of the past who provide the " high spots " in the drama of the human race. It is, however, more than personal interest which should attract us to the study of the leaders of the past. Tactics and weapons change, but the more we read, the more we must appreciate that the qualities of successful leadership remain substantially the same. So much is this so, that we may even hope to find some universal solvent, which may enable us to apply the lessons of the past to leadership to-day.

Success in war and the preparation for it demand qualities amounting to genius in the best sense of the word. Now, genius, like many expressions in every-day usage, requires definition, when applied to leadership. Many people regard genius as a kind of sixth sense denied to ordinary mortals, and leave it at that. On the other hand, disciples of the Max Nordau school would have us believe that genius and even pre-eminence in human affairs is merely an outcrop of degeneracy—on the same general principle that the pearl is a disease of the oyster. Such a definition may be generally true, where genius partakes of that abnormal one-sided development, such as one often finds among artists. It is difficult to visualize Immanuel Kant applying his transcendental philosophy to successful stockbroking, or William Blake in the rôle of a chartered accountant. Such is not the quality of genius to be found in a leader of men. In the cases where powers of leadership have existed despite the frailty of flesh, the cause of success is to be found in the triumph of the spirit over the physical infirmity, rather than in the infirmity itself. The dagger of Brutus accounted for something more than a dying epileptic, and a pain-racked frame consummated our greatest naval victory.

The genius of leadership is not a one-sided affair : its qualities are essentially those of universality. War from being the last argument of kings has developed from a gladiatorial combat into a matter involving every aspiration and activity of the State. Just in such a measure the qualities of leadership to-day must embrace a wider field. Our studies will, however, show us that many of these qualities have

been the outcome of hard work and wide education, and in no sense due to the possession of supernormal faculties.

How, then, are we to approach our study of leadership? Our subject-matter is limitless, and there are many will-o'-the-wisps to lead us from the straight and narrow way. The fulsomeness of Southey must not disgust us of Nelson, nor the drama of Cromwell toying with an Emperor's crown* distract us from his qualities as a leader. Unless we are to be led astray we must apply a more scientific method in our search. Just as the science of war has been summed up in a few simple principles, can we not apply a similar method to our study of leadership? It is suggested that an examination of the subject under the following headings may help us on our way:—

(1) Knowledge, *i.e.*, a wide military education.
(2) Vision.
(3) Stage managership.
(4) Man-mastership.
(5) Maintenance of *morale*.

Knowledge.

Minor tactical successes may be won by leaders possessed of little else but personality. The campaigns which have borne the hall-mark of real success, the victory without a to-morrow, are affairs of the intellect. One salient feature in the success of the great leaders, however diversified the means employed, has been their wide knowledge of war and its lessons. This knowledge has been further characterized by the capacity of the leader for, so to speak, hanging his thoughts on a few pegs. Georges Brandes† tells us that Napoleon had three main stores of supervisory intelligence. Each consisted, it may be said, of a thick mental ledger, which was always kept up-to-date. The first was a military one, the other related to civil and financial matters, whilst the third was a vast mental storehouse of facts relating to human nature.

In the same way, Cromwell, though called to a military career, comparatively late in life, was an ardent student of military affairs, particularly of the campaigns of Gustavus II.‡ If we turn to Nelson, we find the same profound professional knowledge, though this quality has often been lost sight of in the glamour of his personality. In the special conditions prevailing during the recent war, the need for pro-

* "Cromwell's Letters to the English Consul at Genoa" (shortly to be published in Italy).
† "Napoleon—A Critical Study."
‡ "Cromwell." Bostock. p. 183.

fessional knowledge in every rank of commander was apt to be overlooked. Many civilians consider that there is nothing in the training of a soldier which cannot be mastered in a short time by a competent business man. This fallacy is of the same order as entrusting a delicate surgical operation to an income-tax collector, or one's spiritual hereafter to a bookmaker.

Vision.

Knowledge by itself will not lead to success, unless combined with the power of application and the will to achieve. Dominion is not given to the Hamlets of this world, nor success to infirmity of purpose. It was knowledge that saw the weakness in the Persian hosts, but it was Vision that made the Macedonian phalanx. And so throughout history we find this quality of Vision in the great leaders. Sometimes it lies in the application of new weapons and tactics, and sometimes in the wider field of strategy. Viewed in the afterlight of history, many of these innovations may seem commonplace, but we should bear in mind the oft-repeated story of Columbus and the egg. Cromwell's conception of the new army and Napoleon's use of artillery were epoch-making in their time, whilst more recently the use of railways and mechanized road transport in the furtherance of strategic mobility has led to equally important changes in the art of war.

In addition to vision and knowledge, a commander must possess the capacity for translating his ideas into concrete facts. History shows that the materialization of new conceptions, however sound in themselves, requires a high degree of pertinacity. In modern times, when a leader of an army is not a despot, this problem of tilting against mass apathy is all the more acute.

Stage Managership.

The glamour of victory in the field often tends to blind us to the multifarious activities which have led up to the success. In the same way we are accustomed to applaud the actors in a play, and forget the producer and the thousand and one things behind the scenes which have contributed to a finished performance. The moment we get beyond the sphere of a minor tactical success, we are forced to appreciate the importance assumed by the prior activities behind the scenes. Courage in the rank and file may avail nothing, unless the battle has been well staged. It is perhaps not too much to say that Sadowa was won in a Berlin office, and that four years later an imperfect mobilization scheme and a faulty commissariat went far to cost an Emperor his throne.

Be that as it may, our studies must be superficial to a degree if

we do not recognize administrative ability as one of the outstanding qualities of the leaders of the past.

Man-Mastership.

One of the essential qualities of leadership is the capacity for inspiring confidence in the troops, and in a wider sense in the nation. Such a quality is a *sine qua non,* both in the restricted sense of the unit commander, and in the wider aspect of leading armies. In both cases the leader must, so to speak, be a focus of *morale.* Now, *morale* is essentially a quality of the soul, a quality which renders its possessor superior to things material, and to the slings and arrows of outrageous fortune.

In our studies of leadership, we have examples galore of this power of personal ascendency amongst commanders. Little Joan riding to Orleans with blasphemous La Hire and the even more sinister Gilles de Retz in her train. Napoleon, whose presence was worth an army corps to his side, and, perhaps most tragic of all, Napoleon III trying to ape his uncle at Sedan, with his cadaverous face painted up into a smile with theatrical grease-paint. In these later days when the scope of operations does not permit of the personal contact between the leader and his men, the same power is not found lacking. We have only to consider how Petain at Verdun restored cohesion in an apparently beaten army, and, as regards a leader being a focus of *morale* to a nation, we have only to look at Kitchener and his opponent Hindenburg, a man of not unsimilar qualities.

The reasons for the personal ascendency of the various leaders require, however, further analysis. Are these qualities common to them all, or are they separate, independent outcrops, the product of their age and the conditions in which they lived? Genghiz Khan was more than the outcome of despotism, and Joan more than a religious ecstatic.

The rise of a leader is often attributed to a cause—true enough, but Cromwell was more than a hot-gospeller, and Robert the Bruce more than a turbulent clan leader. History, if we read aright, indicates a certain unity of form in the qualities of leadership as applied to *morale.* It is in the methods of application that we find marked contrasts. Despotism and the divine right of kings are phases of the past. The methods of Mussolini would be unsuited to the Saxon temperament, whilst a Wellington or a Moltke would not inspire the genius of a Latin race.

What, then, are the common characteristics of leadership?

Firstly, a peculiar capacity for a kind of expansion of his consciousness, which permeates all ranks and activities of a force. This is in no sense a petty interference complex, but more the quality which

differentiates between an Arthur Nikisch and a hack conductor of a cinema orchestra. It is mainly in this quality of leadership that we are constrained to see genius in the sense of being supernormal.

In a small unit, given personality in the commander, such results are comparatively easily obtained by personal touch. In the higher command such personal touch is in the nature of things impossible. Although not present in the flesh, the great commander still dominates the field by his unseen influence. At Verdun, the words, "They shall not pass," and Sir Douglas Haig's "Backs to the wall" message were more than mere scraps of paper. They seemed no less tangible than the holy relics of the Crusaders and the oriflamme of mediæval French chivalry.

Secondly, knowledge of human nature. This implies not only a knowledge of national characteristics, but also of the reactions of the individual. In a great commander, it amounts to an almost Freudian analysis of the soul of a nation. Its method of application must accordingly vary with the characteristics of the nation concerned. The disciplined slave mentality of Germany under the old regime could swallow the machine-like leadership of the Great General Staff. Latin races have often pinned their faith on inspired mountebanks. The English race requires other qualities in their leaders. Their curious mixture of independence, sentiment and apparent lack of enthusiasm demands special treatment. Perhaps what is needed more than anything else in their case is what, for want of a better term, we call a gentleman. Wellington did not hob-nob with his private soldiers, and we can hardly picture Cromwell as the life and soul of a riotous guest night. Yet, despite this seeming lack of the milk of human kindness, their armies paid them perhaps the very highest compliment they could by bestowing nicknames on them.

Thirdly, a leader must have a wide military education, and the power of transforming knowledge into action. These aspects of leadership have already been discussed. It only remains to point out their very direct bearing on the *morale* of the troops. Ignorance and, what is worse, pride in ignorance, will neither inspire a unit nor an army. In a small unit, professional knowledge in a commander makes itself felt by direct contact. In the case of the higher command it must show itself in powers of supervision. Whilst implying a grasp of essential detail, its force must not spend itself on trivialities. There are instances of inspecting commanders who have had certain foibles amounting to fetishism which have blinded them to the larger issues. Such commanders will never inspire their troops. The great leader, whilst conscious of the individual trees, does not lose sight of the wood. Napoleon's encyclopædic grasp of detail seems sometimes to us to-day to read like a mental *tour de force*—

almost a studied display of knowledge, yet without that grasp of detail there would have been no Jena or Austerlitz.

Finally, we come to the question of discipline and how to enforce it. Some leaders have relied on fear, but the majority of great commanders have obtained their results more by educating the opinion of the rank and file to accept their ordinances as a correct and reasonable military outlook. Discipline on these lines primarily requires confidence in the personality and judgment of the leader. Slave-driving belongs to the past, and to-day we look more for discipline on the unobtrusive but none the less strict lines of Marlborough or Sir John Moore.

Maintenance of Morale.

As already stated, *morale* is a quality of the soul, and we have seen how a great leader is a focus of *morale*. In addition to confidence in personality, *morale* is also engendered by confidence in equipment. The " Soixante Quinze " was undoubtedly a focus of *morale* for the French Army—possibly to the extent of being a source of danger. In a similar way, though not to such a marked extent, we may cite the introduction of the tank. Per contra, indifferent equipment will go far to undermine *morale*. A " premature " in a battery was far worse than merely a burst gun, and an aeroplane which " folds up " in the air is a very natural source of despondency.

An army, however, is not a number of separate individual entities; it must be a team. Although, as we have seen, a great commander can go far to weld the individual elements into a whole, yet an intermediate process is necessary, which may be designated the furtherance of *esprit de corps*. This is particularly true during the preparatory stages of training in peace. The *esprit de corps* of many of the old regiments lasted during the war long after the original members of the regiment had ceased to exist. It was a tremendous asset in leavening the new armies. Great commanders have all realized the value of *esprit de corps,* and have based their foundations of it on the peculiar characteristics of their nation. Napoleon and his eagles, and Nelson with his " band of brothers " are merely diversified media for the expression of the same requirement. In essence, however, *esprit de corps* is arrived at; it should result in a corporate and lasting efficiency, superior to that of its component parts. This is equally true whether we consider an army or a Rugby fifteen. There is, however, a danger, especially in these days, of *esprit de corps* becoming too parochial. It must not be founded on an attitude of self-complacent superiority towards other units, or in belittling other Services. Flodden Field was possibly lost to Scotland by a king who

despised artillery. However, the cure for parochial *esprit de corps* is a wider military education.

Another method of maintaining *morale*, and one which is likely to figure more and more in the future, is Propaganda. It is a valuable weapon in the hands of a leader, but a two-edged one. Its success, especially when directed against undermining the *morale* of the enemy, demands great insight into the psychology of the nations concerned. Like many new devices in war, it may attain a local tactical success at the cost of a strategic setback of no mean order. The old regime in Germany has had ample cause bitterly to regret feeding the fires of Bolshevism.

Conclusion.

So much for our analysis of leadership from the study of history. There is a tendency to-day to regard a study of the past as having no bearing on the problems of leadership in the future. It is sometimes put forward that the advent of the aeroplane, the tank and weapons of that ilk has introduced a new dispensation as regards the military arts. Expressions such as "airmindedness" have been introduced, as implying some curious sixth sense, denied to mortals in the past. Such conceits do not bear close examination. The fundamental problems introduced by new weapons are the same as in the past. Only the application of the principles is subject to change. The essence of great leadership is adaptability to circumstances.

If the history of the human race points to any unity of form—and much has recently been written to this effect—surely nowhere is it so well exemplified as in the qualities of leadership. Nowhere, perhaps, is the old adage so true—"Plus ça change, plus c'est la même chose."

WITH REFERENCE TO OFFICIAL LANGUAGE

INTERESTING comparisons may be drawn between official language and the language of human beings. They need not necessarily be odious; for those who speak disparagingly of official language or would make fun of it (if any such abandoned creatures exist) do so under a misapprehension of its true nature. For, in the hands of an adept, official language may be a very admirable and distinguished medium of expression: and I speak only what is known to be the truth when I say that in many secluded offices in and about Whitehall dwell masters of the pen to whom the drafting of a minute or the fashioning of a departmental report is an intellectual exercise of the highest order, to be accomplished with as exquisite a sense of literary values as ever is felt by the essayist or poet in the throes of secular composition. Official language differs from ordinary language and is in many ways inferior to it, but it has virtues and even chaste beauties of its own.

Before one can adequately appreciate the values of official language it is necessary to understand its purposes and its limitations—almost one might say the philosophy that underlies it. We use language to serve many ends: to state facts, to expound opinions, to express degrees of feeling and to invoke the mysterious faculty of the imagination. Feeling—or, if we choose to be pedantic, the emotional reaction of the writer to his subject—is expressed in choice of words and phrases, in rhythms and cadences, and by other often unconscious devices. Now official language, strictly speaking, has nothing to do with feeling or imagination; in the nature of things it deals essentially with facts and expressions of opinion. Hence the very large number of words that really contain statements of feeling find no place in the official vocabulary and must be kept out of official language if its austere purity is to remain unclouded.

Ordinarily, language is the medium through which an individual expresses himself; and an individual, besides being (in a greater or less degree) a thinking organism, is also compact of feelings—likes and dislikes, hopes, fears, prejudices and desires. Quite properly as a rule, and often necessarily, his choice of language is coloured by the texture of his sentiments. It gives literary form to his personality as a human creature. But official language is not the voice of the individual; it is, or should normally be, the utterance of an office or

department: and a department (more particularly, perhaps, a Government department) can have no feelings. It does not share those common human qualities which Shylock justly claimed for his race. It hath eyes, hands, organs, dimensions, senses, certainly—but not affections or passions. If you prick it, it will not bleed. If you tickle it (unspeakable intimacy!) it will not laugh. A department is an impersonality, almost an abstraction: it has neither sentiments nor æsthetic susceptibilities nor passions nor Sex Appeal. It has no sense of humour, and a joke in an official document would be a shocking and a shameless thing without legitimate parentage.

The writer of an official letter must therefore be vigilant to prevent any shadow or suggestion of feeling from intruding into his phraseology. He must avoid imagery, be extremely cautious in his choice of epithets, abjure metaphor and simile, and he must not write in rhymed or blank verse. It is his duty to convey information with crystalline clarity from one mind to another mind, undistorted by any sentiment of any kind or degree. His courtesy should be the immaculate courtesy of an institution, and expressions of apology or regret must proceed suavely with the fine smooth precision of a well-oiled mechanism. He must have to do only with the clear-cut face-meanings of words and must avoid any that possess pronounced emotional implications (examples of such words are "jolly" and "cheerio"). His words and phrases must find an echo only in the mind, not in the senses of the reader.

Mr. I. A. Richards, in his book *Practical Criticism,* has some interesting things to say about certain kinds of adjectives that have some bearing on the character of official language. He distinguishes a certain class of adjectives which he calls "projectile." We may, for example, say of a cathedral that it is

an *old* cathedral,
a *magnificent* cathedral,
a *renovated* cathedral,
a *depressing* cathedral.

The epithets "old" and "renovated" refer to definite ascertainable characteristics that the cathedral possesses, qualities in it that do actually exist outside the experience of the observer. It would remain *old* or *renovated* even if the entire human race had ceased to exist some weeks previously. But the words "magnificent" and "depressing" really describe only a state of mind that the sight of the cathedral excites in the person beholding it. As Mr. Richards puts it, these are "words which really indicate not so much the nature of the object as the character of our feeling towards it." Such words could not with propriety be used, except perhaps in peculiar circumstances, in official

correspondence, and thus a whole class of adjectives—*amazing, disgusting, exciting, dreadful, sublime,* are haphazard examples—must be excluded from the official vocabulary. It may be said on behalf of a command or a department that a tower is square, but not that it is sublime. For commands and departments are assumed to possess intelligence and can recognize and appraise a geometrical design, but they do not possess souls conscious of the manifestations of sublimity.

This article aims only at making a simple analysis of the difference between official language and the language of ordinary human intercourse: it is not intended to be a treatise or Handbook for Beginners in the Art and Craft of Official Correspondence. Thus nothing will be said about the need for dignity, formality, and decorum; these are obvious and one may almost say accidental requirements and do not distinguish official language specifically from other forms of writing. In view of occasional criticisms, however, it is necessary to say that official language has nothing to do with official jargon; still less with that debauched and febrile form of composition sometimes flattered by the term "business English." The man who would willingly write, "*Re* your esteemed favour of even date to hand, I shall have pleasure in quoting in answer to same . . ." has sold his birthright for a mess of verbiage. He is the sort of man who would wantonly torture dumb animals and fan his cocoa with his bowler hat. Away with him. Official language may be kept almost entirely free from jargon, though one regrets that established usage tends to force upon us those strange exotics "proximo" and "ultimo." It is a little disappointing that a race that has for its heritage the works of Shakespeare and the Authorized Version should puddle about and rake up an ungainly latinism to express so simple an idea as "last month." The almost hallowed phrase "with reference to your letter *regarding* the above-named subject" must itself be regarded with ill-concealed regret, and a phrase like "under separate cover," though harmless in itself, becomes distasteful with endless repetition. The reckless iconoclast who in an abandoned moment dares to write "the documents are being forwarded to-day in a separate packet" will do a notable service to the cause of liberty of speech. Men have figured in the Birthday Honours for less.

Official language, if it is to retain its suppleness, must rid itself of *clichés*. They are not a necessary part of it; they are excrescences, barnacles that must not be allowed to attach themselves permanently to its living body. Official language must be direct and precise and succinct and lucid, but it need never be hackneyed. Provided it is borne in mind that it is an expression of the intellect and not of the emotions, and that it has nothing in common with any sort of jargon, its chief difficulties should be easily overcome. Keats could write:

Far, far around shall those dark-clustered trees
Fledge the wild-ridgéd mountains steep by steep,
And there by zephyrs, streams and birds and beasts
The moss-laid Dryads shall be lulled to sleep,

whereas the official chronicler may be constrained merely to observe that "at a distance of one-and-a-half kilometres the land rises sharply, forming a series of scarped ridges thickly covered with coniferous trees capable of providing adequate cover to a body of troops against hostile observation from the air." For agreeable reading we may prefer Keats's version, but the more stark method of official language may be acceptable English, bearing in mind its differing purpose. Let us compare two well-known passages:

(*a*) . . . daffodils
That come before the swallow dares and take
The winds of March with beauty . . .

and (*b*) $2 + 2 = 4$.

Each in its way exhibits perfection of literary style: the writer of official correspondence should model his style upon the second example.

Space does not permit me to discuss the semi-official letter, that amiable mongrel wherein the austerities of official correspondence are mercifully tempered but the full racy *bravura* of the purely personal communication may not be indulged. In a semi-official letter the humanity of the writer is gravely conceded, but he is expected to curb the too-colourful ebullitions of his temperament. He must not betray animal spirits. The shadow of the department looms behind him and darkens the sunshine of his style. Experience and a nice discrimination alone can tell one where to draw the line in a semi-official letter. One might say of a thing in a semi-official letter that it was *magnificent*, perhaps even that it was *sublime;* but scarcely that it was *tophole*.

Official language ceases to be irksome or tedious when its true nature is comprehended. When it is seen for what it really is—language stripped bare of all inflections, stark thought translated into stark words—it may even begin to exercise a curious fascination. One may be moved to find a grave excitement in seeking to extract from it subtler and yet more subtle refinements of meaning, more and more delicate intellectual innuendos. Finally, and it is in this that the arch-masters of the craft find their ultimate reward, it may be employed with such consummate *finesse* that even meaning itself is swallowed up and consumed in the sheer brilliance of its multiform intricacies. Consider an Income Tax schedule.

C. L. M.

AIR STRATEGY

By Wing-Commander A. G. R. Garrod, M.C., D.F.C., *p.s.a.*

Man is a conservative animal by nature, and it would indeed be miraculous if one did not find that a considerable lapse of time is always required before sound principles can be evolved regarding any important new development of man's activities. It is difficult to adapt our minds to a changing world and to break away from established traditions. It is not surprising, therefore, that, although the creation of the Royal Air Force was accepted with little comment during the strenuous days of war, the mention of Air Strategy after the war as an important new field of study called forth much opposition and even ridicule in certain quarters. The resulting controversies have led to considerable confusion of thought, and an attempt will be made in this article to clarify the issue

(*a*) by presenting arguments to show that Air Strategy is a subject as distinct from Naval and Military Strategy as these two are distinct from one another;

(*b*) by considering some of the problems which concern the Air strategist in peace and war.

The Application of Air Power.

It is always advisable to start an inquiry by giving a definition of the subject, and one may define Strategy as being " the art of disposing and directing armed forces for the ultimate defeat of the enemy."

Now, we are accustomed to regarding the art of the Admiral in this respect as something quite distinct from the art of the General. We should never dream of confusing Naval with Military Strategy. Each has its own definite sphere, and each is the subject of an extensive literature. But this has not always been so. In days when it was a great adventure to " go down to the sea in ships " men regarded sea warfare as a mere branch of land warfare, as a sort of extension of the battle area out on to the sea beyond the flanks of the armies. Even as recently as the seventeenth century soldiers used to be placed in command of naval ships and squadrons.

To-day, however, with a world-wide use of the sea for communica-

tions and commerce, it is universally recognized that the application of strategic principles to war at sea is quite different from their application to war on land. This distinction has been assisted by the clearly defined boundary that exists at the shore line between the two elements of sea and land. There can never be any doubt as to the dividing line of responsibility between the sailor and the soldier. It has thus been an easy process to recognize that Naval and Military Power are two separate means of applying pressure by force to an enemy, and that Naval and Military Strategy form the art of applying Naval and Military Power respectively.

In precisely the same manner, Air Strategy is the art of the application of Air Power, and our minds should be all the more prepared to recognize this new branch of Strategy when we remember that Naval Strategy (now universally accepted) is a comparatively recent development. But it is necessary, if an answer is to be given to the question " What is Air Strategy? " to establish that Air Power is a distinct means of applying pressure to an enemy.

Here one comes face to face at once with the great difficulty that men have in breaking away from their familiar idea of a sharp division between the sea and the land. Add to this the fact that for centuries men's minds have been accustomed to think of all human movements as being confined to two dimensions in these two elements only, and it is easy to understand why men cling so tenaciously to the idea of there being one kind of air over the land and another kind of air over the sea. Men, in fact, have great difficulty in grasping the universality of the air. They fail to realize that the air is a medium of travel and communication and of delivering attacks, which knows no boundaries such as confine the land and sea, which contains no obstacles to movement in any direction, and which covers and indeed unites both land and sea alike.

It is this failure to realize the true nature of the air and consequently of Air Power, that has led to so many false arguments. A notable example is contained in an article called " British Air Power " which appeared in the *Quarterly Review* for July, 1926. The writer of this article drew a perfectly logical distinction between war in the air and war from the air, and pointed out reasonably enough that the former was subsidiary to the latter. He was quite correct in his contention that air fighting (the struggle for air superiority) is not an end in itself, but aims at giving freedom of action for the main task of air bombardment, or war from the air.

The Control of Air Forces.

So far, so good. But now comes the fallacy. Because, says the writer, the objectives of war from the air are situated on the land or

the sea—lie, in fact, " on the ground plane "—therefore it is absurd that the control of air forces in war should be divorced from that of other forces organized for the attack of objectives on the ground level.

The confusion of thought is apparent at once. The writer has erected in his mind an impenetrable barrier between the air over the land and the air over the sea. He has forgotten that air forces, whether based ashore or afloat, can with equal facility attack objectives on sea or land. He has failed, in fact, to grasp the universality of the air.

Although armies have on many occasions in the past been used to capture fleets in harbour, and, although fleets have bombarded points on the coast or have been used to turn the flanks of armies resting on the shore, yet the overlapping zone of the operations of armies and navies has been limited by the range of their gunfire. In the main, they are each concerned with objectives in their own element.

But, owing to the nature of the air itself, air forces are not so confined. The same air force can either

(*a*) attack fleets at sea or in harbour;
(*b*) attack naval dockyards and other establishments;
(*c*) attack military arsenals and mobilization centres;
(*d*) attack armies in the field.

It would be of little avail, therefore, for the General to say that he was quite happy because for the time being he might be free from air attack, if the Admiral were being prevented by the enemy's Air Power from protecting the transport of supplies and reinforcements to the army. The fact is that the air situation concerns them both equally.

And there is yet another point more important still. The same air force that can attack the objectives mentioned above can exert direct pressure on the *morale* and resisting power of the enemy by attacking his whole organization of communications and means of production. There is no need to develop this theme in a review such as THE ROYAL AIR FORCE QUARTERLY, since its importance is obvious to every Air Force officer. Moreover, the aim of the present article is rather to expose the false arguments that have been put forward regarding Air Power and Air Strategy, than to emphasize this new method of producing a decision in war. It is sufficient, therefore, to point out that the air situation is not only the vital and equal concern of the army and navy, but directly affects the government and the whole civil population as well.

In fact, the air situation is as all-embracing as the air itself. Air warfare intermingles intimately with Sea and Land warfare, and, moreover, provides an additional means of exerting pressure upon

the enemy. Air Power cannot be split up into the Air Power of the Sea and the Air Power of the Land, any more than the air over the sea can be fenced off from the air over the land. Divided control of this power offends the principles of concentration and unity of command with the same force as in the handling of Naval or Military Power, and will always be attended with the same disastrous results.

It is thus seen that Air Power is a distinct means of applying pressure to an enemy, and Air Strategy is the art of wielding this power for his ultimate defeat.

Air Problems.

Having answered the question, "What is Air Strategy?" it is now possible to proceed to the second portion of this article and enlarge our understanding of the subject by considering some of the problems that concern the Air strategist in peace and war. In this examination no attempt will be made to find a solution of these problems, since this is not possible within the scope of a short article. The object is rather to indicate the wide ground covered by the subject of Air Strategy, and to show how it deals with problems that are akin to those of Naval and Military Strategy and yet form a distinct field of study.

Our definition of Strategy spoke of it as the art of disposing and directing forces. But since it is only in war that there will be active operations to direct, the aim in peace-time is to dispose your forces in such a manner that they will be most suitably placed for delivering their attacks on the outbreak of war.

Now, the first responsibility of the Air Force is the defence of Great Britain, the heart of the Empire, against air attack. So the first task of the air strategist is to calculate the weight of attack that could be delivered against Great Britain and to estimate the strength and composition of the force required for its defence. The maxim that "offence is the best defence" applies with even greater cogency to air forces than to other forces, since it is impossible to erect barriers or obstacles in the air, and the high speed of aircraft in three dimensions gives them great powers of evading the intercepting aircraft and thus renders the task of the defence very difficult. It follows that as much of the available strength as possible must be allotted to the bombing squadrons, and only sufficient retained in the form of fighter squadrons to provide direct protection of centres vital to the maintenance of the offensive. The only sound method of causing the enemy to weaken his air attacks on us is for us to hit him still harder until he is forced to take up a defensive attitude. This principle must be constantly borne in mind in peace-time when considering the ratio to be maintained between bombing and fighter squadrons.

Mobility—Air Bases.

In reviewing the disposition of air forces overseas, the air strategist has to consider the Empire as a whole, and to calculate how far he can economize in the strength of his force by increasing its mobility. Here there is still much work to be done.

Aircraft have always provided a means of applying pressure to the enemy with greater speed and over a wider radius than any other form of warlike power. In other words, within their range from their base air forces are more mobile than naval or military forces. But true mobility, and with it true economy, will never be attained until squadrons can move from base to base with the same facility as that with which they can operate from a base where they are established. To achieve this aim, two requirements must be met:—

(*a*) A sufficient number of bases must be provided to form a continuous chain from one end of the Empire to the other.

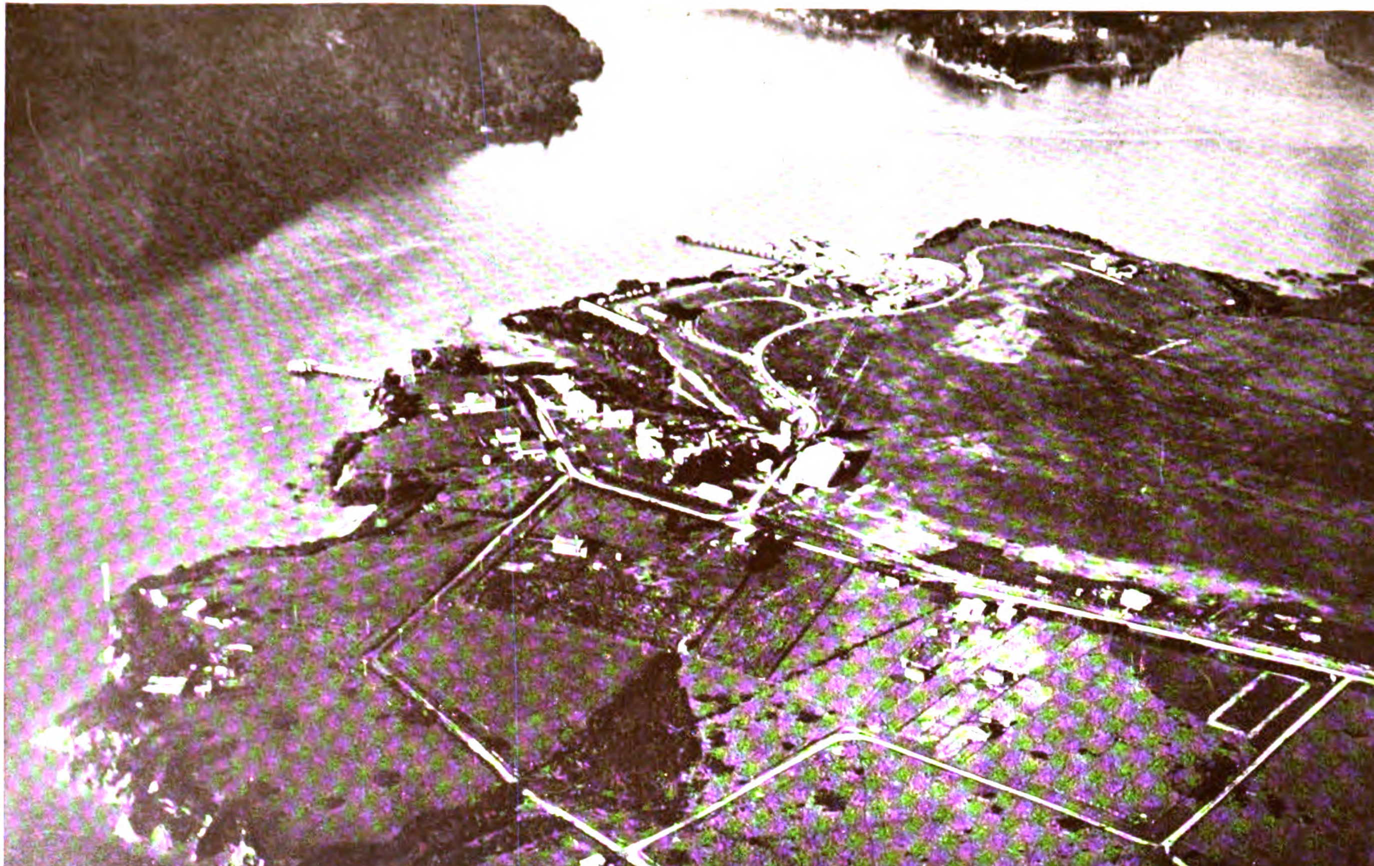
(*b*) The organization of bases and of squadrons must be such as to allow complete units to move by air, and be able to operate from their destination without having to wait for the slower move of an elaborate unit headquarters.

The first of these two requirements has already been satisfied between Cairo and Basra, but every effort is needed to extend the chain to Calcutta and Singapore, and from Singapore to Australia and to Hong-Kong. It will be a still more difficult problem to bridge the gap between Britain and Egypt. Treacherous air currents round the Rock of Gibraltar greatly impair the value of this site as an air base, and with the present endurance of Service aircraft an intermediate base is certainly required between Britain and Malta.

The second requirement deserves the attention of every Air Force officer, since it is entirely an Air Force problem. It is only necessary to mention a few of the considerations involved to see how far-reaching a problem it is.

Whole sections of the Imperial chain of bases will be joined by stretches of sea, the bases themselves consisting of sheltered expanses of water. It follows that squadrons moving along this route must have aircraft which can shed their land undercarriages and take floats in their place, just as the aeroplanes of the first Cairo-Cape flight fitted floats in Egypt to continue their journey on to England. Pilots, too, must be trained to alight with equal ease on land or water. The feasibility of this is shown by the fact that in each British Schneider team there have been pilots who have never flown seaplanes before, and who yet have learnt within a few weeks to handle from the water the most delicate and sensitive seaplanes devised by man.

Then again it is clear that the smaller the variety of aircraft types,



N.Z.A.F. Base, Auckland.

the smaller will be the stock of spares that will have to be kept at each base. This argues for the development of a general purpose type of aeroplane for overseas service which shall be standardized over as wide a portion of the Empire as possible.

Lastly, there is the problem of the organization of the squadrons and of the bases themselves. This is the most difficult problem of all, since it may involve radical alterations to the present system of squadron organization. No squadron can transport by air its maintenance personnel as well as its fighting crews, and yet the squadron will be useless at its destination without its maintenance personnel. Either airships and freight aircraft will have to be used to transport mechanics and spares, or maintenance work will have to be organized by bases rather than by squadrons.

Whatever may be the solution of these problems, sufficient has been said to show that there is ample work to absorb all the energies of the air strategist in peace-time. Mahan's dictum that " Bases are the indispensable foundation upon which the superstructure of the offensive is raised " is just as true of air forces as it is of navies. Given the necessary air bases, one may regard the air forces overseas (grouped in Egypt, Iraq, India, and Singapore) as being within mutual supporting distance of one another, with the Australian and South African Air Forces as probable reinforcing contingents, and with the Home squadrons as an Imperial Reserve in the event of a war involving no air threat to Great Britain.

Turning from peace to war, the first thing to bear in mind is that no modern war can be the concern of one fighting service alone; all three services are parts of the national defence organization, and constitute one weapon in war. For example, the Navy can rarely produce a decision in war without an army or air force to exert pressure on the heart of the enemy nation. Great Britain is the only country that could be defeated in a short time by a victorious hostile navy acting alone. Against all other countries a navy alone has, as Admiral Richmond has said, " little offensive power in major strategy, but when it is associated with military forces it becomes a very formidable instrument."

Similarly, no army can leave these shores in war-time except under the protection of the Navy; and an air force based overseas depends not only on the Navy for its supplies, but also on the Army for the protection of its aerodromes. In fact, all the fighting forces must act with a single purpose and yield to a central co-ordinating will. Nevertheless, it will inevitably occur that the relative importance of the operations of each service will vary from time to time, and it will be the duty of the air strategist to apply air power in the manner best suited to further the naval or military aim, at such times when the

interests of these two predominate. It is impossible, within the scope of this article, to discuss the various ways in which air power can intervene to assist the land or sea battle. Time only permits consideration of the contingency when the Cabinet has decided to use Air Power either to produce a decision by itself, or to weaken the general resisting power of the enemy and so pave the way for the army's advance. Of the many problems that will confront the air strategist under such circumstances two only will be selected for discussion, with the object of illustrating the point that the handling of Air Power, though governed by the same principles that have always applied to the traditional forms of warfare, is yet a distinct art requiring a distinct training and experience.

Air Intelligence.

The first problem is that of War Intelligence. There has never been a commander in war who could say that he knew all he wanted to know about his opposing commander and the enemy's forces generally. It is obviously impossible to attain " Stonewall " Jackson's ideal and " mystify, mislead, and surprise " your enemy, unless you are familiar with his habits, and the more you can get to know about his probable intentions the less likely are you to be surprised yourself. Now, the Intelligence required by the Admiral and the General is mainly that regarding the strength, disposition, *morale,* and habits of the opposing naval and military forces, since the immediate aim of these commanders is the destruction of those forces. But the aim of the commander in an air war is the disorganization of the whole of the enemy's resources for military production, and this implies the obtaining of an entirely new kind of Intelligence—political, social, and economic. It must always be remembered that disorganization rather than destruction is the aim of this kind of warfare, partly because it is more economical, and partly because it is equally effective. There is the further point that in modern warfare one has to think of the resumption of trade with the coming of peace, and it is undesirable to destroy possible future markets.

If, therefore, one has to control the air bombardment of a powerful air force so as to achieve the greatest possible disorganization of the enemy's resources for carrying on a war, one must acquire a very intimate knowledge of his whole political, social, and economic system. This implies a knowledge of the channels of supply and distribution of all commodities required for the upkeep of the forces and of the location of the warehouses where such articles are stored. And when all the data have been collected, a sound appreciation must be formed regarding the particular sphere of the enemy's national activities whose disorganization will lead to the most profitable results.

Here is a whole new field of study for the air strategist, a field which brings him into close association with the international economist, a field that lies quite apart from the normal collection of intelligence regarding the mere strength, disposition and fighting efficiency of the enemy's armed forces.

The Air Objective.

The second problem is that of the correct objective for air forces in an air war. A hint of this problem has already been made in speaking of Air Intelligence, when it was said that the aim of the air force commander was not first and foremost the destruction of the enemy's air forces. This statement now requires a little amplification.

The ultimate object of a military commander in war is to control the internal administration of the enemy country, but before he can occupy the country for this purpose he must first defeat the opposing army which bars his progress. He cannot ignore that army so long as it remains an organized fighting force. If he attempts to do so he will find his own communications severed and himself the victim of defeat. For this reason the immediate aim of the military commander is always the destruction of the enemy's army as a necessary preliminary to the control of the internal administration of his country. In point of fact, a military nation will nearly always surrender as soon as its army has been defeated, to avoid the humiliation of hostile occupation of its territory.

Now with the navy the situation is slightly different. The ultimate aim of the naval commander is the control of sea communications, and here again the best means of ensuring this control is to destroy the enemy's armed naval forces. But this cannot be regarded as an essential preliminary, as it is for the military commander, since it is possible for the hostile fleet to avoid action by remaining as a " fleet in being " behind the shelter of a naval base. The naval commander cannot, therefore, afford to wait for a decisive naval victory before proceeding to his ultimate aim of controlling sea communications.

In air warfare this difference is carried one stage farther still. Not only can the enemy avoid action if he chooses by remaining on the ground, but even when both sides are seeking action contact may not be obtained in the infinite spaces of the air. More than this, it is not possible to obtain a decisive defeat of an enemy's air force. A navy, once destroyed, cannot be replaced before the lapse of many years. An army, once defeated, immediately lays open the road into the heart of its country, and enables the enemy to occupy that country before a fresh army can be organized to oppose him. But an air force is not defeated in a day and a modern industrial nation can replace its air casualties, both in pilots and in aircraft, so readily that neither

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side can ever assume that a complete victory in the air has been attained.

These are the reasons why the air force commander can afford still less than the naval commander to wait for a decisive victory over the armed forces of the enemy before proceeding to his ultimate aim in war. If he were to wait, he might do so until the war was over, only to find that his own people had forced the government to sue for peace. At the same time, the air strategist will have to exercise the soundest judgment throughout the air operations to ensure that his squadrons are not unduly interfered with by the enemy, and if an opportunity presents itself for the quick destruction of enemy air forces he will have to seize it as a temporary and profitable diversion from his main purpose.

It is hoped that the above description of Air Strategy and of some of the problems which concern the air strategist in peace and war will help to dispel the confusion that has surrounded the subject in some quarters in the past.

CO-OPERATION BETWEEN THE ARMY AND ROYAL AIR FORCE DURING 1929

BY WING-COMMANDER T. L. LEIGH-MALLORY, D.S.O.

DURING the year 1929, five Army Co-operation Squadrons have been available to work with the Army. These squadrons are under the command of the Air Officer Commanding No. 22 Group—who is responsible for the supervision and co-ordination of all Army Co-operation work in this country—and are disposed as follows:—

No. 2 Squadron, Manston.—Eastern Command.
No. 4 Squadron, Farnborough.—Aldershot Command (2nd Division).
No. 13 Squadron, Andover, and Odiham (during training season).—Aldershot Command (1st Division).
No. 16 Squadron, Old Sarum.—Southern Command and School of Artillery.
No. 26 Squadron, Catterick.—Northern, Scottish, and Western Commands.

ARMY STAFF EXERCISES.

R.A.F. officers from No. 22 Group attended all the Staff Exercises held by the War Office, Commands and Divisions during the year. An exercise of special interest from the R.A.F. point of view, which dealt with the handling of bombing and fighting squadrons in an expeditionary force, was attended by Air Commodore N. D. K. MacEwen, C.M.G., D.S.O., Group Captain C. L. Courtney, C.B.E., D.S.O., Group Captain E. L. Gossage, D.S.O., M.C., and a number of other Air Force officers. Much benefit was derived and lessons learned during the course of the exercise. It is a problem which up to the present has been little dealt with in peace-time, and it is just as essential for the Army to realize the important part which the employment of bombing formations can play in carrying out a military plan as it is for Air Force officers to realize how bombers and fighters can best be employed in assisting a military commander to attain his object. Exercises of this kind help both the Army and the Air Force to clarify their ideas, and it is hoped that other exercises of a similar nature will be held.

Besides attending the above exercises, brigade schemes have been conducted by each of the Army Co-operation Squadrons, under the supervision of No. 22 Group. These schemes have illustrated the inter-working of Army formations with the Army Co-operation Squadrons allotted to them. These schemes have now become an annual institution, and there is no doubt they contribute very materially to the better handling of Army Co-operation Squadrons by the Army formations to which they are affiliated, and the improvement in the issue of orders and instructions by the Army to the Air units.

In addition to these brigade exercises, a number of Army officers have been attached to R.A.F. squadrons to gain air experience and knowledge of R.A.F. tactics and organization. Attachments of this kind have been taking place now for many years; it would appear there is a tendency for them to decrease. This is mainly due to the necessity for squadrons to concentrate on the training of their pilots in essential R.A.F. duties during the individual training period, which means that extraneous activities must be cut down to the smallest possible limits.

The following is an outline of the Co-operation which has taken place during 1929:—

Aldershot Command.

Co-operation has been provided for the 1st Division by No. 13 Squadron and for the 2nd Division by No. 4 Squadron. These squadrons have taken part in all Divisional Exercises, Brigade Exercises and Signal Exercises held by these divisions. Towards the end of the training season, No. 4 Squadron accompanied the 2nd Division to Salisbury Plain Area for the War Office Exercises with troops. At the same time, No. 13 Squadron carried out a practice mobilization and moved to Netheravon. On the last day of the War Office Exercise, No. 13 Squadron took the place of No. 4 Squadron, and carried out co-operation for the 2nd Division on that date.

Eastern Command.

No. 2 Squadron co-operated with brigades in the Eastern Command. As no divisional concentrations took place this year, the squadron took part in as many brigade exercises as possible, having to detach flights to Colchester and Dover for the purpose.

Southern Command.

No. 16 Squadron co-operated with the 3rd Division and the 42nd T.A. Division during its period of training on Salisbury Plain. The 3rd Division did not concentrate on Salisbury Plain until August 19th,

which involved detaching officers and aircraft on occasions to Plymouth and Portsmouth to co-operate with brigades in these areas.

Northern, Scottish, and Western Commands.

No. 26 Squadron, Catterick, worked with these three Commands. As very few Regular troops exist in these Commands, and units are extremely scattered, co-operation entailed using a great many landing grounds in Scotland, North of England, and West of England. Their work mostly took the form of lectures and demonstrations to the troops in the areas visited. The squadron was concentrated at Catterick for the brigade training of the 13th and 15th Infantry Brigades, and it took part in several interesting brigade days during that period.

Artillery Practice Camps.

The general principle followed this year was for aircraft to co-operate with the artillery brigades belonging to the Command to which their squadron is affiliated. This involved aircraft co-operating with practice camps at Larkhill, West Down, Okehampton, Redesdale, and Buddon. The only practice camp where co-operation was found to be impossible was at Trawsfynydd. In order to give the brigades at this place some experience, officers went from No. 26 Squadron at Catterick to deliver lectures on the subject to them. It is hoped that in future years the subject will be dealt with by a gunnery instructor at this camp.

Coast Defence.

The Coast Defence Co-operation Flight situated at Eastchurch has carried out much practice in ranging coast defence guns with the Royal Artillery at Shoeburyness. In addition, the flight co-operated with the coast defences at Portsmouth and Plymouth during the summer.

Balloons.

The School of Balloon Training has been somewhat interrupted this year by having a detachment at Pulham Airship Works during the early part of the year. They were, however, able to send balloons out on Salisbury Plain to work with the artillery brigades which carried out their practice camps there. Many Royal Artillery officers were taken up in the balloon during this period.

It is not possible in an article of this nature to discuss the various exercises which have taken place during the year's training, but it is thought that it might be of interest to investigate some of the points which have arisen.

Orders and Instructions.

A very essential feature of co-operation between the Army and the R.A.F. is the adequacy of the orders and instructions which are issued by the General Staff to the Army Co-operation Squadrons working with them. Von Moltke said, " He who sends out a reconnaissance gets the results that his instructions for it deserve." This statement was never more thoroughly justified than it has been by the need for adequate instruction to be given for air reconnaissance. These instructions have been improving in a very marked manner during the past two or three years, owing to the constant practice which is being obtained during the various Staff Exercises and exercises with troops. This year's experience, however, has shown that there is, in some cases, still room for improvement in this respect. It is interesting to note that in the revised edition of Field Service Regulations, Vol. 2, the details which should be included in operation instructions are the same for all branches (cavalry, armoured cars, etc.) of the Army as they are for the R.A.F., and that the details laid down are exactly what the R.A.F. has been asking for, and getting, during the past two or three years.

It is unfortunate that artillery commanders do not seem to get quite as much practice in handling aircraft allotted to them as do the General Staff, with the result that artillery orders have not, as a general rule, reached as high a standard as the instructions for reconnaissance. One or two points do not appear to be generally realized. For instance, pilots when on artillery patrols can simply send calls for information or they can call for concentrations of fire on fleeting targets, or, again, can range individual batteries by sending corrections for either single or groups of rounds. The artillery commander concerned probably has very definite views as to what he wants done, but if he wishes to produce the desired effect, he must obviously tell the pilot exactly what action he wants him to take. On several occasions during the training season this was not done, with the result that a quite unfair onus was placed upon the pilot concerned, to divine what action they really were required to take.

Another misconception which occurs is with regard to the R.A.F. operators with artillery commanders and batteries. In peace-time they are with their squadrons, and more often than not are sent out to R.A. units for specific operations, but in war these operators stay with the R.A. units the whole time, with the result that the artillery commanders concerned are responsible not only for feeding and transporting them, but also for issuing them with all their orders. They want to know when to bring their sets into action and where; what wave-length they are to work on; and what zone to listen for. With-

out these details an operator at a battery is hopelessly lost, and he cannot get them other than through the R.A. unit he is working for.

THE SORTIE SYSTEM.

It was found last winter that the French had a system designed to assist the Army and Air Commanders in making out orders for the employment of Army Co-operation aircraft. In this system, each squadron carries out so many sorties or missions. The number of sorties which a squadron can carry out on any one day will, of course, vary in war. A squadron with its twelve aeroplanes complete could probably supply eighteen sorties, and as the number of serviceable aircraft was reduced by casualties so would the number of sorties be reduced accordingly. One can imagine an Army Co-operation Wing Commander during a war with, say, three Army Co-operation Squadrons under his command. Before seeing the Corps Commander to arrange the next day's work, he would find out from each squadron how many sorties they could supply the following day; we will say, for sake of argument, that they can do sixteen, fifteen and twelve, a total of forty-three for the whole wing. The Wing Commander then sees the Corps Commander, and they agree that the following work shall be done the next day:—

(*a*) Three Medium Reconnaissances. (*Note.*—These will probably have to be carried out in a small formation of three aircraft; therefore, each medium reconnaissance will take three sorties—total, *nine sorties.*)

(*b*) One Close Reconnaissance to be maintained on the front of each division. There are two divisions in the line, and fourteen hours of daylight. Each aeroplane is two hours in the line; therefore each division will take seven sorties—total, *fourteen sorties.*

(*c*) Two aeroplanes are to be at the disposal of the Corps Artillery Commander for the whole day—total, *fourteen sorties.*

Grand total of sorties, thirty-seven.

Thirty-seven sorties out of the possible forty-three have been used up. This leaves six sorties which the Corps can call on for photography, special reconnaissance, or to meet extra demands of the C.C.R.A.

This has been tried out this training season, and it seems a convenient means of enabling the Army to keep the score and know exactly how they stand at any time during an operation. The scheme will be tried again next year, and would appear to have sufficient advantages to be adopted for regular use.

Radio Telephony Tenders.

The increase in the use of radio telephony for close reconnaissance during the past few years has made it evident that the present allotment of one R/T tender per division is inadequate. The reason for this is that on occasions it is most necessary for sub-formations to receive the close reconnaissance information direct, although they may not actually be controlling the R/T aeroplane. For instance, while a division is advancing with an advanced guard, it is really essential for both the Divisional Commander and Advanced Guard Commander to have an R/T tender. It must, however, be borne in mind that, where this is the case and only one close reconnaissance aeroplane is working for the division, they cannot both be allowed to talk to the aeroplane; one of them must be detailed in orders as the controlling tender, the other being for listening-in purposes only. This system has been tried out during the year's training with considerable success, but it has been evident that, on occasions, the listening-in tender has not received all the messages sent down. This fact was not realized by the General Staff at the Army formation concerned, and consequently valuable information was sometimes missed. This should not happen, since each message bears a serial number to enable a check to be kept as to the continuity of the messages received. It has also occurred that, where it has been realized that a message has been missed, there has been a tendency to regard the R.A.F. R/T tender as the natural means of getting the missing message from the controlling R/T tender. It must be emphasized that the R/T tenders must be kept solely for work with aircraft, because, if they are engaged in point-to-point work, information will certainly be delayed and possibly lost altogether. Consequently, where it is necessary to obtain a message from the formation which has the controlling tender, the Army signal system must be employed for the purpose.

Intercommunication.

That there should be good intercommunication between an Army formation and the R.A.F. squadron working for it is obviously an essential for smooth working. Naturally, the ideal state of affairs is for a telephone line to be laid between the two headquarters. It may, however, happen that headquarters are moving rather frequently, and the nature of the country does not permit of the moves of the aerodrome keeping pace. Under these circumstances, a telephone line is out of the question. The obvious solution of the difficulty is to use two-way W/T for the purpose. With this in view, this means of communication has been tried out in most Commands this year, and has on the whole proved successful. There are, however, one or two points worth noting:—

(*a*) This means of communication will chiefly be used for sending supplementary orders for reconnaissance to the squadron, also situation reports in which the Intelligence Liaison Officer and Squadron Artillery Officer can instruct pilots. A good deal of practice is required to prevent these becoming so long as to be a serious inconvenience when being transmitted by W/T.

(*b*) These orders and situation reports are obviously matters of immediate importance. On occasions, delays of about two hours have occurred through these going into the signal office, although a special W/T set was set aside for communication with the aerodrome. If these orders and situation reports are to be effective, they must evidently pass straight from the General Staff to the W/T transmitter.

(*c*) It must not be forgotten that the best method of sending situation reports from the squadron to the Army formation is for the next aeroplane up to drop them. If the W/T is used, urgent messages from the Army formation may be unnecessarily delayed.

Height at which Reconnaissances are Carried Out.

During the past few training seasons, aircraft have been flying at 3,000 feet and over when carrying out reconnaissances. It became necessary to order this, owing to the fact that aircraft were flying much too low over the enemy lines, and consequently getting far more information than they would in war. During this training season, cases of reconnaissance aircraft flying below 3,000 feet have been rare. There is, however, a feeling that a close reconnaissance pilot should on occasions be allowed to fly low, when specially required to clear up the situation in the immediate vicinity of our own troops and as he will be ordered to do in war. It is understood that this will be carried into effect during next training season; it will be interesting to see if pilots who have never been fired at from the ground will carry out these reconnaissances in a manner which would be practicable in war.

Smoke.

Trials of Army Co-operation aeroplanes laying smoke screens by using baby smoke bombs took place in both the Aldershot and Southern Commands. It would appear that laying smoke within the range of our artillery is not a legitimate task for aircraft, and consequently it is surmised that the only justification for considering aircraft as possible smoke layers in land operations is in connection with armoured forces. This year's trials have shown that if Army Co-operation aeroplanes are to lay a screen with sufficient accuracy, they

must come down to about 800 feet, at which height they are extremely vulnerable. It is presumed that the places which would have to be smoked would be held in some strength by the enemy. To be of any use to the tanks, this smoke would have to be laid some two minutes before the arrival of the tanks, which would mean that the entire attention of the enemy would be focussed on the aeroplanes, while the smoke laying was in progress. It is felt that this would cause a quite unjustifiable number of casualties to the Army Co-operation aeroplanes.

The alternative would be for the smoke to be dropped by the fighters normally employed in anti-tank gun work. As they would have no better bombing sights than the Army Co-operation aeroplanes, they, too, would obviously have to come down to below 1,000 feet; they would not be quite so vulnerable owing to the speed. When one considers how dependent smoke is on the direction of the wind being just right, and on being laid with absolute accuracy, it is thought that the fighters would be better employed attacking the enemy anti-tank guns with their 20-lb. high-explosive bombs and machine-gun fire, as they did in the last war. Laying smoke screens is at best an indifferent gamble and does not appear to justify the very considerable risks which would have to be undertaken by the aircraft laying them, when other more effective and less hazardous means of silencing anti-tank guns appear to exist.

Night Flying.

No night reconnaissances over troops have been carried out during the training season. However, after the end of the season, some experimental night reconnaissance flares, which have been designed purely for peace training, were tried. These were found to be most successful. There appears to be little doubt that they can be dropped over troops with safety. On their trials they worked with 100 per cent. success. The introduction of these flares marks a very definite advance. In future training seasons it is hoped that the R.A.F. should get more experience in night reconnaissance over troop concentrations, and the troops themselves gain a much better idea as to what they may expect, when carrying out night movements in war.

Conclusion.

While offering some comments on the year's training, it is just as well to remember the tremendous volume of work that has been carried out and the excellent assistance which the Army Co-operation units have received from the Army, all of which needs no comment. Also, when comparing the present year with, say, four years ago, there is little doubt that the standard of work is higher, the liaison better, and the control of Army Co-operation squadrons by their Army formations yearly becoming more efficient.

REPORT ON THE AIR OPERATIONS IN AFGHANISTAN

Between December 12th, 1928, and February 25th, 1929

(Being extracts from the report by Air Marshal Sir W. G. H. Salmond, K.C.B., K.C.M.G., D.S.O., Air Officer Commanding R.A.F. (India), contained in Command Paper 3400 of September, 1929, published by H.M.S. Office, and reproduced by kind permission of the Controller.)

Historical Note.

On the 14th November, 1928, the Shinwaris, one of the principal tribes in Eastern Afghanistan, broke out into open rebellion, and, after looting a few minor posts, invested Dakka, and took up a position on the main road from Kabul to Khyber, with the result that, from this time onwards, all road and telegraph communication with India along this route was cut.

On the 19th November, the Shinwari lashkar moved westward along the Kabul road and invested Jalalabad.

Meanwhile, the Afghan Mohmands, although not actually participating in the rebellion, moved a lashkar down to the Jalalabad area, with the intention of sharing in the loot should Jalalabad fall. The road from Kabul to Peshawar, therefore, remained closed owing to bridges having been blown up and looting by marauders, who had been attracted to the area by the disturbance.

Disorder was spreading to the Southern Province, where the Shinwaris had sent emissaries to raise the tribes there to revolt. This resulted in the road from Kabul to Quetta via Kandahar becoming unsafe and the British Legation was cut off by road and land line via Torkham, and left with the Afghan Government wireless station at Kabul and the land line via Quetta and Kandahar which, however, was only working intermittently as the only means of communication with the outer world. Later it was cut off, by the rebel advance, from all communication with these stations also.

On the 14th December, 1928, Habibullah Khan (Bacha-i-Saqao) advanced on Kabul with a Kohistan lashkar of approximately a thousand men, and by a "*coup de main*" captured the Koh-i-Lula Forts, one mile north-west of the city, securing many rifles and much ammunition. Having captured the Koh-i-Lula Forts, the rebels estab-

lished themselves on the Asmai Heights, west and south-west of the British Legation. Their advance was checked in the area between the Legation and the city. In consequence, the British Legation was cut off from the city, and from other Legations, and became the unintentional recipient of shells and bullets directed at the rebel forces.

Up to the 14th December, the general attitude in India was one of growing apprehension as to future developments.

Isolation of British Legation.—By Tuesday, the 17th December, the situation had changed rapidly to one of acute anxiety. The only remaining means of communication with the British Legation, through Afghan wireless, ceased abruptly during the transmission of an urgent message from Sir Francis Humphrys. This was to the effect that he wished to evacuate the women and children of the British Legation as soon as possible, and requested a reconnaissance aeroplane to be sent up to Kabul. This message was dated the 16th December and was received on the 17th December.

The story of how communication was opened up, how the women and children of the British Legation were evacuated on the 23rd December, how all the women and children of the Foreign Legations were evacuated subsequently, and how during January and February the complete evacuation of British Indian subjects and most of the Foreign Legations' personnel, culminating finally in the evacuation on 25th February, 1929, of the British Legation itself, was effected, will be told elsewhere. It will be sufficient here to note the fact that, from the 18th December to the 25th February, communication between the British Legation, Kabul, and the Government of India was, in one manner or another, consistently maintained by the Royal Air Force.

The geographical location of the British Legation has an important bearing on the situation. The British Legation, unlike other Legations, stood in large and spacious grounds some 2½ miles from Kabul on the Kohistan road.

It was along this road that Habibullah had advanced on the 14th, and it was owing to this situation of the British Legation in the battle area between the Afghan regular forces and the rebels that its position became so critical. From the 17th to the 22nd December, 1928, the British Legation was in " No Man's Land."

On 22nd December, King Amanulla made a determined move against Habibullah and drove him from the outskirts of Kabul to the country to the north-west, thus restoring communication between the British Legation and Kabul.

A period of relative inactivity followed so far as the rebels and the King's forces were concerned. The situation, however, rapidly and consistently deteriorated, desertions from the King's forces were many,

and mediation on his behalf at Jalalabad showed no signs of being successful.

On the 10th January, Habibullah again commenced to advance, and by continuous harassing of the King's forces, destroyed their morale and on the night of the 14th-15th January, almost without opposition, captured the city and surrounded the Royal Palace.

During the afternoon of the 14th January, realising the difficulties of his position, Amanulla abdicated in favour of his brother Inayatulla and later in the day proceeded by road to Kandahar. On the 16th January, Habibullah proclaimed himself Amir, and assumed the title of Amir Habibulla Khan.

On the 17th January, Inayatulla abdicated, and on the 18th and 19th January, he, together with his entire family, were evacuated to Peshawar, whence they proceeded by special train to Chaman and thence to Kandahar by road to join Amanulla.

Immediately after the evacuation of Inayatulla, the Royal Palace was surrounded and occupied by Amir Habibulla Khan without resistance.

With the situation in this condition of instability, it became apparent that little justification could be found for the retention of a diplomatic mission in Afghanistan; in fact, the presence of the British Legation in Kabul was a source of continuous anxiety. It was decided, therefore, at the earliest opportunity, the evacuation of British and foreign nationals should be proceeded with, and the staffs of the Legation reduced to cadre with a view to their complete withdrawal at a moment's notice, should any emergency arise.

The situation practically remained the same from the 20th January to the 25th February, on which date the final evacuation of the British Legation took place.

HISTORY OF THE OPERATIONS OF THE ROYAL AIR FORCE

FROM 18TH DECEMBER, 1928, TO 25TH FEBRUARY, 1929.

The operations culminating in the evacuation of the British Legation on 25th February may be conveniently divided into four phases:

FIRST PHASE.—The actual opening up of communications from the 18th December to the 22nd December.

SECOND PHASE.—The evacuation from 23rd December to 1st January of the women and children of the British and Foreign Legations at Kabul.

THIRD PHASE.—The evacuation of King Inayatullah and his family; this covered a period from 2nd January to 19th January.

FOURTH PHASE.—The evacuation of the British and foreign subjects

culminating in the withdrawal of the British, German, French and Italian Legations. This period extends from 20th January to the 25th February, 1929.

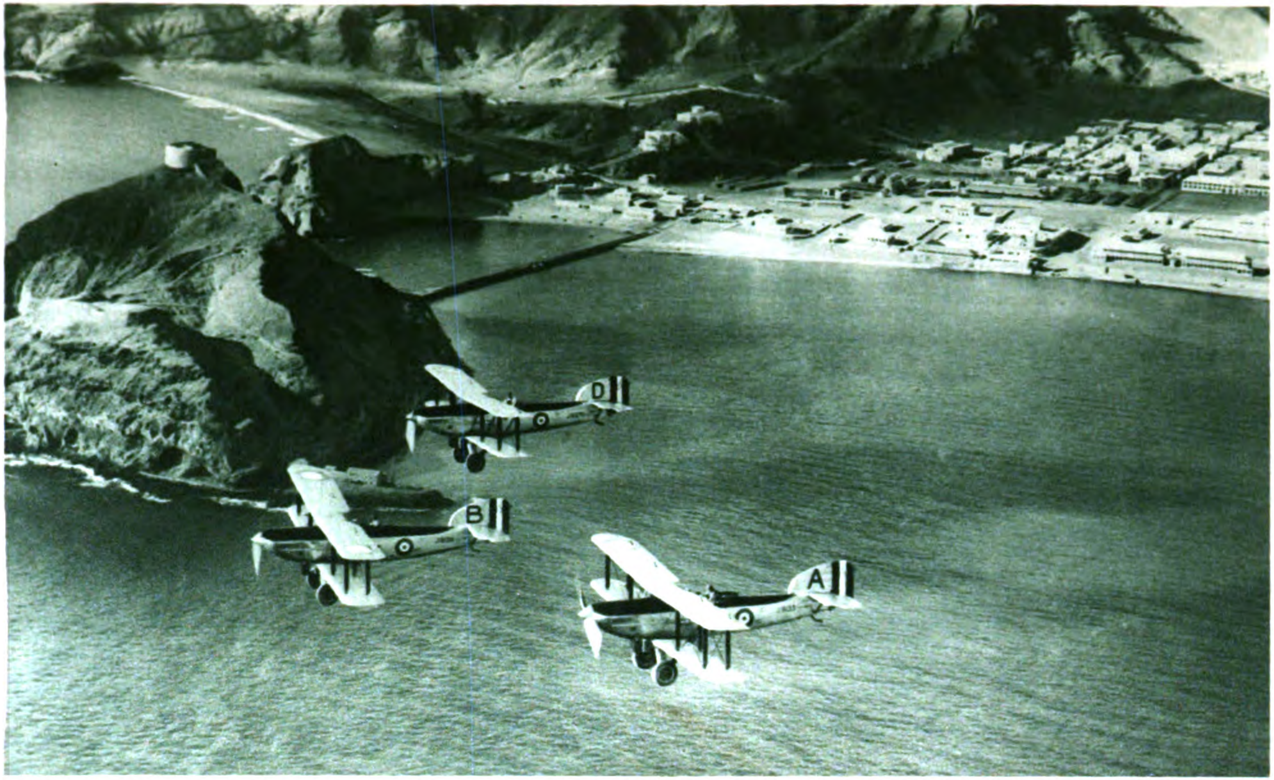
FIRST PHASE.

18th December to 22nd December, 1928.

OPENING UP OF COMMUNICATION FIRST PHASE.—The situation that arose on the 17th December appeared to be critical when communication was finally cut off, the last message received being a request from Sir Francis Humphrys that an aeroplane would be sent up to make arrangements for the evacuation of women and children. It was decided that it was essential immediately to establish and maintain communication with the Legation. It was not known whether aircraft could land at Kabul, and nothing was definitely known as to the type of reception our machines would have when they arrived there. Certain things were agreed upon at the outset. In order to prevent any accusation of intervention in the rebellion or espionage being levelled against us, *every machine that went up did so unarmed and without cameras.* All offensive weapons were stripped off the machines and the pilots themselves carried no revolvers. In addition it was arranged that pamphlets should be carried which were to be dropped over the chief centres of disturbance, explaining the humanitarian mission on which the Royal Air Force were engaged, and conveying a warning against acts of aggression against the British Legation and Consulates.

FIRST RECONNAISSANCE. FLYING OFFICER TRUSK SHOT DOWN.—At 0800 hours on the 18th December, Flying Officer Trusk was despatched to Kabul with orders to drop a message and Popham Panel on the British Legation. Necessary instructions were enclosed. On arrival over the British Legation, the pilot observed signals displayed telling him not to land but to fly high; in order to make certain, however, of dropping the Popham Panel, he came down low, and in doing so, was heavily fired on, the radiator and oil pump being hit. The pilot realised that he had to make for some landing ground, and although comparatively low he sent through W/T signals notifying that his machine had been hit and that he was forced to land. These signals were received by Peshawar W/T and intercepted at Air Headquarters, Delhi. The machine landed without further damage on Sherpur aerodrome. Fourteen bullet holes were subsequently found in the machine, but although the engine was rendered completely unserviceable, the crew were uninjured. Owing to the damage to his machine the pilot had to abandon the idea of dropping the Popham Panel.

After Flying-Officer Trusk had landed at Sherpur aerodrome, the



Aden. A Flight of No. 8 (B) Squadron.

machine was met by Afghan and Russian pilots, among whom was the Commander of the Afghan Air Force. The Commandant gave orders for the machine to be put in a hangar and guarded.

As there was no prospect of Flying-Officer Trusk and L.A.C. Donaldson reaching the British Legation in the near future owing to the heavy fighting round the Legation, the Air Force Commandant arranged accommodation for them in the "Cafe Wali," an Afghan "Hotel" in the centre of the city.

On being told that the Popham Panel which Flying-Officer Trusk was to have dropped on the British Legation was important, the Afghan Commandant sent it to the Legation with an escort of soldiers and it was dropped over the Legation wall the same afternoon.

During the next four days, Flying-Officer Trusk tried to get news of the British Legation from the other Legations and the Afghan Foreign Minister, but without success. He also tried to get into communication with India by means of Afghan Wireless and land line *via* both Peshawar and Quetta and by using his aeroplane W/T apparatus as a ground set. The latter failed, owing to the accumulators running down. Eventually a land line message, stating that permission had been obtained from the Afghan Government for a machine to land at Sherpur, reached Peshawar. As this message was not endorsed by the British Minister, it was not acted upon.

On the morning of 22nd December, Flying-Officer Trusk received a message from the Minister that it was safe to proceed to the British Legation, so, after permission had been given by the Afghan Foreign Minister, Flying-Officer Trusk and L.A.C. Donaldson proceeded to the Legation, where they remained throughout the whole of the operations.

Second Reconnaissance on 18th December.—Immediately Flying Officer Trusk's signal was received on the 18th December that he had been shot down, a second D.H.9A, piloted by Flight-Lieutenant Prendergast, was despatched on the same errand, and, although the machine was hit, no damage was suffered, and a Popham Panel was successfully dropped. Ground strips spread outside the Legation said "Do not land" "Fly High" "All's well."

It is as well here to state the enormous relief which the appearance of the Royal Air Force over the British Legation on the 18th gave to the Legation personnel in Kabul.

By the evening of the 18th, therefore, much that was dark concerning the safety of the British Legation had been cleared up. The British Legation was obviously in the middle of opposing forces, but they were well, and, so far, secure.

Sir Francis Humphrys, by his signals displayed on the lawn of the Legation, did not wish our pilots to land at Sherpur or anywhere.

He wished us to fly high in order to avoid rifle fire. It was clear, therefore, that the British Legation was completely cut off from Kabul, that it was isolated, and that the situation was one of grave anxiety.

RECONNAISSANCE ON 19TH DECEMBER.—On the morning of 19th December, one D.H.9A, piloted by Flight-Lieutenant Pelly of No. 60 Squadron, carried out a reconnaissance of the British Legation. The same ground strips were displayed as on the previous day, and Popham Panel messages were read stating " Sherpur aerodrome unfit " " We are confined to the Legation."

On the evening of the 19th December, the message already referred to from Flying-Officer Trusk was received at Delhi through the Kabul-Kandahar-Chaman-Peshawar land line, which had previously been silent, saying that Flying-Officer Trusk had made arrangements for machines to land at Sherpur. After discussion with Sir Denys Bray, it was agreed that the reconnaissance machine of the 20th should inform Sir Francis Humphrys of this message, and ask him whether he approved of the machines landing at Sherpur. It had been decided that under no circumstances, in view of the delicate position of the British Legation, should anything be done which had not the prior approval of the British Minister at Kabul.

Accordingly Sir Francis Humphrys was requested to put out either " Yes " or " No," indicating his agreement or otherwise, and he was informed that a second machine would be sent up on the afternoon of the 20th December in order to receive his reply.

MORNING RECONNAISSANCE, 20TH DECEMBER.—On the morning of the 20th December, one D.H.9A, piloted by Flight-Lieutenant Fullergood, carried out a reconnaissance of the British Legation. Similar ground strips were displayed outside the Legation, but the Popham Panel message read " Situation improving " " Come again to-morrow." The message referred to in the previous paragraph was dropped by this machine.

AFTERNOON RECONNAISSANCE, 20TH DECEMBER.—In the afternoon of the same day, one D.H.9A, piloted by Flight-Lieutenant Smetham, carried out a reconnaissance of the Legation, and similar messages to those of the morning were read. No " YES " or " NO " was visible. An Aldis Lamp was successfully dropped by means of parachute. The machine came down low to ensure accuracy of dropping, and as a result was hit by rifle fire and one flying wire was broken. Eight bullet holes were subsequently discovered in the machine.

RECONNAISSANCE, 21ST DECEMBER.—On the morning of the 21st a D.H.9A, piloted by Flying-Officer McKee, attempted a reconnaissance, but was forced to return owing to ignition trouble. A second D.H.9A, piloted by Flying-Officer Wisher, successfully reconnoitred the Legation. The following signals were read : " All's well " " Fly

North " and " Come again to-morrow " " Do not land." In addition, a large " NO " was laid out. Aldis lamp signals were also transmitted from an upper window of the Legation, but were unreadable, owing to interference of the buildings, etc.

As a result of this reconnaissance, it was clear that Sir Francis Humphrys did not approve of our machines landing at Sherpur.

RECONNAISSANCE, 22ND DECEMBER.—On the 22nd December, one D.H.9A, piloted by Flight-Lieutenant Prendergast, carried out a reconnaissance of the Legation. The following signals were communicated " Am receiving Peshawar W/T Signals " " Don't Land " " All's well " " Come again to-morrow."

WIRELESS TRANSMITTING SET FOR THE LEGATION.—It had been recognised since the 19th December how extremely useful it would be if a wireless transmitting set could be dropped into the Legation. The possession and operation of such a set would very largely decrease the strain on the reconnaissance machines, which were daily going up to receive these visual signals from the Legation itself. Steps had been taken to prepare a light transmitting set, and Squadron-Leader Lister, my Squadron Leader Signals, had issued the necessary instruction for its packing, with a view to its being dropped by parachute into the Legation. On the evening of the 22nd December, therefore, I drafted orders for the dropping of this set on the 23rd. The problem was how to drop the set without the machine being shot down, as in any case, it would be necessary to come low in order to make certain that the parachute would drop in the Legation grounds. It was decided to send up two machines, one of which was to act as decoy, and arrive over the Legation five minutes before the other machine appeared. The other machine was to approach from a low height and, as soon as the decoy machine saw it approach, it was to drop a parachute laden with rubbish to attract the notice of the marksmen on the ground. These orders were on the point of being issued when a message was received at my Headquarters from Group Headquarters, Peshawar, stating that Sir Francis Humphrys had asked for the evacuation of women and children on the 23rd December.

This message completely altered the situation.

Our reconnaissance had returned at 1225 hours on the 22nd, correctly reporting the complete isolation of the Legation, and no further reconnaissance had been made that day.

Suddenly, however, the Afghan wireless, which had been cut off for the use of the British Legation since 17th December, opened up on the evening of the 22nd December, with a clear line wire from the British Minister, stating that, on the afternoon of the 22nd, two high Afghan officials had been to the British Legation and gave authority for the women and children to be evacuated on the following day

(23rd December). It transpired later that during the afternoon of 22nd December, King Amanulla had driven the rebels back and so opened once more communication between Kabul and the British Legation.

Instead of a forced evacuation, with all the perils attending such a course, having to be undertaken, the peaceful evacuation of the women and children from the British Legation now appeared to be practical, to the immense relief of all.

This closed the first phase, a phase in which the Royal Air Force had fortunately been in a position to clear up the situation of the British Legation at Kabul during this critical period, thus relieving very great anxiety.

SECOND PHASE.

23rd December, 1928, *to 1st January,* 1929.

EVACUATION OF WOMEN AND CHILDREN—SECOND PHASE.—Group Captain R. P. Mills immediately wirelessed me his proposals for the evacuation on the 23rd December. These were approved. They were to the following effect:—

One Wapiti machine, piloted by Squadron-Leader Nicholas, followed by one Victoria, piloted by Squadron-Leader Maxwell, and three D.H. 9A's, pilots Flight-Lieutenant Prendergast, Flight-Lieutenant Pelly and Flying-Officer Fullergood, should proceed to Kabul and land at Sherpur for the evacuation of women and children of the British Legation. The Wapiti machine was sent up first as a precaution, so as to ensure that the other machines were not committed to Sherpur aerodrome without everything being in order. These orders were duly carried out, the total number of women and children being evacuated to Peshawar being 23. All these were carried in the Victoria, the D.H.9A's carrying baggage. The Wapiti was the wireless machine, keeping the Group Headquarters informed of the progress of the operation.

Captain Nichols and Sergeant Peters of the Royal Corps of Signals, with a short wave wireless transmitting apparatus for the Legation, were flown to Kabul on the outward journey. This set, which maintained touch with the R.A.F. station at Peshawar and at times with the R.A.F. stations at Lahore and Delhi, was henceforth the only means of communication between the Legation and India. It proved invaluable.

SECOND EVACUATION OF WOMEN AND CHILDREN.—On 24th December the Wapiti and Victoria, accompanied by 11 D.H.9A's, landed at Sherpur and evacuated 28 women and children, mostly French and German.

RECONNAISSANCE ON CHRISTMAS DAY.—It was agreed with Sir

Francis Humphrys on 24th December that no evacuation would be carried out on 25th December. It was also agreed that, in the event of no wireless communication being received from the Minister by 1000 hours, a reconnaissance machine would proceed to Kabul to ascertain whether all was well. On 25th December, as no wireless signal had been received, one D.H.9A proceeded to Kabul, landed there and received instructions for the following day.

EVACUATIONS, 26TH DECEMBER.—On the 26th December, one Victoria, piloted by Squadron-Leader Maxwell, accompanied by four D.H.9A's, landed at Sherpur, and evacuated 23 women and children. One German woman was unfortunately struck by a propeller; though seriously injured, she completely recovered, and was evacuated at a later date. The damaged propeller was replaced by the one on Flying-Officer Trusk's machine, and the aeroplane returned to Peshawar the same day.

AERODROME UNSERVICEABLE OWING TO BAD WEATHER.—On the 27th December, the British Minister wirelessed that, owing to heavy falls of snow and bad visibility, it was impossible for the machines to land at Kabul and further evacuations should be delayed until instructions were received from him. On this date, the Hinaidi arrived at Risalpur.

FOURTH EVACUATION OF WOMEN AND CHILDREN.—On 29th December, weather conditions having again become settled, the British Minister wirelessed that machines should be sent for further evacuations. Accordingly, one Victoria, piloted by Squadron-Leader Maxwell, one Hinaidi, piloted by Flight-Lieutenant Anderson, landed at Sherpur and evacuated 31 women and children. These consisted of Indians, Germans, Italians, Turks and Syrians. Major Erskine, the Military Attaché for Kabul, and two fitters with a new engine, propeller and radiator for Flying-Officer Trusk's machine, together with blocks and tackle, were taken to Kabul on the outward journey.

SECOND VICTORIA ARRIVES AT RISALPUR.—On the same day, one reinforcing Victoria, piloted by Flying-Officer Anness, arrived at Risalpur.

FIFTH EVACUATION OF WOMEN AND CHILDREN.—On the 30th December, two Victorias, piloted by Squadron-Leader Maxwell and Flying-Officer Anness, landed at Sherpur and evacuated 23 women and children (one Indian and 22 Turks).

SIXTH EVACUATION OF WOMEN AND CHILDREN.—On the 31st December, the British Minister at Kabul stated that there remained one German and five Turks who desired to leave Kabul, and that he had obtained authority for them to be evacuated on 1st January. Flying-Officer Anness, in his Victoria, completed this evacuation on the 1st January. A pilot and rigger of No. 27 Squadron were taken on the

outward journey, and they flew back Flying-Officer Trusk's machine, which was shot down on the 18th December.

CONCLUSION OF SECOND PHASE—ALL WOMEN AND CHILDREN EVACUATED.—Thus ended the second phase of the operations. It will be noticed that by this time the situation had improved considerably. Instead of a situation of acute anxiety as to the safety of the women and children in Kabul, events had come about, through the operation of the Royal Air Force, whereby a great load of responsibility was removed from the various Legations in question, through the evacuation of their women and children. This phase also marks the return to India of the only machine which had so far suffered misfortune, namely, Flying-Officer Trusk's machine.

THIRD PHASE.

2nd January to 29th January.

The women and children having been removed from Kabul, the urgency for evacuations became less acute. It could not definitely be foreseen how the new situation would develop after the pushing back of Habibullah's forces. It was possible that King Amanulla's authority would be re-established. During this period, the road between Peshawar and Kabul remained impassable, and in order to maintain communication the British Minister obtained King Amanulla's approval to a weekly air mail service between Peshawar and Kabul, which should take all mails for the Afghan Government and for the foreign Legations in Kabul.

One Victoria, piloted by Squadron-Leader Maxwell, therefore, arrived at Sherpur on the 9th January, conveying mails and stores, He returned to Peshawar the same day, bringing back mails from Kabul and evacuating five British Indian subjects.

CAPTURE OF KABUL.—On the night of the 14th-15th January, as previously stated, Kabul was occupied by Habibullah, and Amanulla abdicated in favour of his brother Inayatulla.

EVACUATION OF INAYATULLA.—On the 18th January, two Victorias, piloted by Squadron-Leader Maxwell and Flying-Officer Anness, landed at Sherpur aerodrome at 1220 hours and returned after embarking King Inayatulla, who had abdicated, and 11 other members of the Royal family. The aerodrome was surrounded by Habibulla's troops and in certain respects the situation might well have become critical. On arrival at Sherpur fire was opened from a neighbouring hill, but this was quickly stopped by order of Habibullah.

On the 19th January, the same two Victorias and pilots proceeded to Sherpur, and brought back 13 passengers, the remaining members of the Royal Household.

During these evacuations, all aircraft conveyed mails and stores for various Legations on the outward journeys.

CONCLUSION OF THE THIRD PHASE—PEACE INSTEAD OF WAR IN KABUL.—This ended the third phase.

It has its own special importance as the circumstances attending the abdication of King Inayatulla, his surrender of the Royal Palace, and his removal by air to Peshawar, constitute an event unique in history.

The evacuation of King Inayatulla and his family saved Kabul, in the words of Sir Francis Humphrys through whose good offices it was arranged at the request of both parties, " from a horrible massacre." Once the attack on the Arg had begun, the destruction of Kabul could hardly have been avoided, with the instant consequence that the safety of all the Legations would have been gravely imperilled.

FOURTH PHASE.

20th January to 25th February.

FOURTH PHASE.—As previously stated, it became clear about the 20th January that the withdrawal of the British Legation was, sooner or later, inevitable. Before, however, this could be done, it was necessary to give an opportunity to the other Legations and the British Indian and other foreign nationals living in Kabul to evacuate before the British Legation finally did so.

On 23rd January, Sir Francis Humphrys obtained permission from the Afghan Government for machines to proceed daily to Kabul, to carry out progressive evacuation. This sanction was accorded, on condition that not more than two machines should land daily, except on Wednesdays, when the weekly mail machine increased the total to three.

At this stage, the aircraft available were as follows:—

One Hinaidi, Pilot, Flight-Lieutenant Anderson.

Three Victorias, Pilots, Squadron-Leader Maxwell, Flight-Lieutenant Chapman, and Flying-Officer Anness.

Two Wapitis.

24 D.H.9A's, Nos. 27 and 60 Squadrons, and held in reserve in case of emergency.

Subsequently, reinforcements of five more Victorias arrived on the following dates:—

8th February, two, Pilots, Squadron-Leader Rice and Flight-Lieutenant Horry.

11th February, one, Pilot, Flying-Officer Switzer.

14th February, one, Pilot, Flying-Officer Greenhalgh.

15th February, one, Pilot, Flying-Officer Crowder.

INTENSE COLD AND ITS EFFECTS.—By this time a period of intense cold had set in.

The lowest air temperature recorded in flight was minus 3° F., and that at Sherpur aerodrome was zero.

This intense cold introduced certain technical aspects which could hardly have been foreseen. They were all surmounted in due course, but not without the loss of one Victoria.

On 27th January, intimation was received from the Minister that two aeroplanes would be required to carry out evacuation on 29th January. Accordingly, one Victoria, piloted by Flight-Lieutenant Chapman, and the Hinaidi took off from Risalpur at 1000 hours. These machines were ordered to proceed in company, as wireless was carried in the Hinaidi only, it having been omitted from the Victoria in order to effect a saving of 400 lb. which is the additional load involved in carrying a wireless operator and apparatus. Unfortunately, the Victoria was compelled to return to Risalpur for minor adjustments, and on recommencing the journey, lost touch with the Hinaidi. The Hinaidi reached Kabul at 1220 hours, having experienced engine trouble *en route* owing to intense cold.

On arrival, although it was a standing order that engines should be kept running whilst machines were at Sherpur, Flight-Lieutenant Anderson found that he could do nothing, and the engines stopped. In spite of every effort, it was not possible to restart the engines of the Hinaidi at Sherpur, owing to the impossibility of applying sufficient heat to the carburettors. Flight-Lieutenant Anderson thereupon reported by wireless that it was necessary to send up a fitter with catalytic lamps and tool kit.

The Victoria was notified as overdue, and it was evident that it had forced landed.

Reconnaissance machines were immediately despatched to search the route, but without success.

On 31st January, two Victorias, pilots Squadron-Leader Maxwell and Flying-Officer Anness, left for Kabul. Squadron-Leader Maxwell was forced to return owing to engine trouble, but Flying-Officer Anness reached Kabul at 1255 hours, and returned to Peshawar with eight passengers and mails.

The engine trouble reported by Squadron-Leader Maxwell was due to water in the benzol mixture. This would not have been so serious, had it not been for the fact that, owing to the extreme cold, the water froze. This question of water freezing appeared to point out the cause of Flight-Lieutenant Chapman's forced landing.

PRECAUTIONS TAKEN TO GUARD AGAINST WATER IN THE BENZOL.—In order to minimise the possibility of further catastrophes from this

cause, refuelling and storage arrangements at Risalpur were immediately overhauled, and the following precautionary measures carried out:—

(*a*) All fuel was filtered twice before being passed into the tanks.

(*b*) On completion of the day's flying, all petrol filters were cleaned, and tanks filled up overnight.

(*c*) Before proceeding to Kabul, each aeroplane carried out a short test flight, flying for a few minutes on each tank, then landed, and all petrol filters were cleaned.

These precautions proved to be successful.

As a further precaution, each aeroplane in future carried W/T and an operator, and also an Indian interpreter in the event of a forced landing. Through the agency of the Chief Commissioner N.W.F.P., six Pathan volunteers were obtained and despatched to Risalpur for this duty.

On the 1st February, two Victorias, piloted by Squadron-Leader Maxwell and Flying-Officer Anness, left for Kabul, carrying the spares for the Hinaidi. Both aeroplanes landed at Sherpur at 1215 hours, and returned to Peshawar with 21 British subjects.

On the 2nd February, bad weather prohibited all flights to Kabul. Flight-Lieutenant Anderson at Kabul reported that he had only been able to start one of his engines, owing to the failure of two of the catalytic lamps, and he asked for some more lamps to be sent up.

On the 3rd February, two Victorias, pilots Squadron-Leader Maxwell and Flying-Officer Anness, left for Kabul with the additional spares required for the Hinaidi. Both aeroplanes arrived at Sherpur at 1230 hours and brought back 22 passengers of various nationalities.

On this day, the Hinaidi was made serviceable, and arrived back to Peshawar at 1530 hours, with one passenger, bringing the total evacuated during the day to 23.

On the 4th February, two Victorias, pilots Squadron-Leader Maxwell and Flying-Officer Anness, arrived at Kabul at 1230 hours, and brought back 27 passengers of various nationalities. Mails for the Legation were carried on the outward journey.

On the 5th February, Squadron-Leader Maxwell and Flying-Officer Anness proceeded to Kabul and brought back 28 passengers.

On this day, the Hinaidi carried out a test at 10,000 feet, and it was found that, by blanking the oil coolers and lagging the oil pipes, satisfactory oil temperature could be maintained. From this time onward, the Hinaidi worked with unfailing regularity.

Subsequent evacuations up to the 20th February inclusive, without incident, proceeded as follows:—

Date.	*Machines Employed.*	*Pilots.*	*Number Evacuated.*	*Remarks.*
February 6th	2 Victorias	Sqdn.-Ldr. Maxwell ...	37	Mails were taken to Kabul.
		F./Off. Anness ...		
	Hinaidi ...	F./Lt. Anderson ...		
February 7th, 8th, 9th & 10th	—	—	—	No flights owing to bad weather.
February 11th	4 Victorias	Sqdn.-Ldr. Maxwell ...	58	Mails taken to Kabul.
		Sqdn.-Ldr. Rice ...		
		F./Lt. Horry		
		F./Off. Anness ...		
February 12th and 13th	—	—	—	No flights owing to bad weather.
February 14th	2 Victorias	Sqdn.-Ldr. Rice ...	20	
		F./Lt. Horry		
	Hinaidi ...	F./Lt. Anderson ...		
February 15th	1 Victoria	Sqdn.-Ldr. Maxwell ...	16	
	Hinaidi ...	F./Lt. Anderson ...		
February 16th	—	—	—	Minister did not require flights.
February 17th	3 Victorias	F./Off. Switzer ...	18	
		F./Off. Crowder ...		
		F./Off. Greenhalgh ...		
February 18th	2 Victorias	Sqdn.-Ldr. Rice ...	15	On outward journey an Afghan courier and mails to Legation were carried.
		F./Lt. Horry		
	Hinaidi ...	F./Lt. Anderson ...		
February 19th	3 Victorias	F./Off. Switzer ...	20	The Secretary to the Turkish Legation was taken to Kabul.
		F./Off. Crowder ...		
		F./Off. Greenhalgh ...		
February 20th	3 Victorias	Sqdn.-Ldr. Maxwell ...	22	
		Sqdn.-Ldr. Rice ...		
		F./Lt. Horry		

On the 23rd February, the Minister reported that a track 1,000 yards long by 120 yards wide had been prepared by trampling down the snow, and it was thought it would be suitable for Victorias. Four Victorias, preceded by the Hinaidi, were thereupon despatched to Kabul. Immediately after landing, Flight-Lieutenant Anderson despatched a message to Group Headquarters, reporting that the ground was unsafe for Victorias, as there was 17 inches of snow on the ground. The four Victorias then approaching Kabul were recalled by W/T.

Flight-Lieutenant Anderson reported that he was unable to take off in the Hinaidi, and would be forced to remain at Kabul. He stated that with the aid of a large working party, obtained by the Minister, he would clear a track completely of snow.

On the outward journey, the Hinaidi had taken up Count Plessen, the newly appointed German Minister at Kabul.

On the 24th February, Flight-Lieutenant Anderson reported that a track 600 yards long by 20 yards wide had been cleared of snow and was fit for Victorias to take off along. Four Victorias were thereupon despatched, Squadron-Leaders Rice and Maxwell, Flight-Lieutenant

Horry and Flying-Officer Switzer. All landed and took off successfully, and, together with the Hinaidi, brought back a total of 27 passengers. This concluded the evacuation of the French and Italian Legations.

There now remained only the British Legation—the Minister and his Staff, and it was decided that the operation should be concluded in one day.

FINAL EVACUATION.—On the 25th February, therefore, the Hinaidi and seven Victorias were despatched from Risalpur at intervals from 0745 hours onwards. One Victoria was in reserve, and the pilot was ordered not to land at Kabul unless a prearranged ground signal was laid out by the Minister. Actually this machine was not required. All machines returned to Peshawar by 1300 hours, evacuating a total of 39. The last aeroplane conveyed Sir Francis Humphrys, Flying-Officer Trusk, and L.A.C. Donaldson.

Thus concluded the work of evacuation, a total of 586 passengers of various nationalities having been rescued from Kabul.

So ended the fourth phase. During this period the Royal Air Force had flown a total of 28,160 miles in the actual performance of evacuations. They had flown 33,930 miles if the opening stages and the flights in connection with the evacuation of Flight-Lieutenant Chapman and Flying-Officer Davies are included, and a total of 57,438 miles if the journeys of the Victorias from Iraq to Risalpur are included. They had flown over the most difficult terrain, over mountains averaging 10,000 feet in height, during one of the severest winters on record, and over country which afforded very few opportunities of making a successful forced landing.

One machine was lost, through no technical fault in the equipment, the failure being solely due to the unexpected presence of water in the benzol mixture, which froze in the intense cold, and so blocked the carburettors.

All machines returned successfully to their bases, except the Victoria mentioned above, and no British personnel, including the pilot and second pilot of the forced landed machine, who were rescued by air, remained in Afghanistan on the 25th February.

In addition, communication with Kabul throughout this critical period was maintained by the Royal Air Force, and finally, once the transmitting set had been sent up to the British Legation on the 23rd December, the Royal Air Force, through their wireless organisation, assumed the responsibility for the transmission of all Sir Francis Humphrys' messages to the British Cabinet, Government of India, and elsewhere, as well as those from the outside world to the British Legation, Kabul.

I submit that the history of these evacuations constitutes a record

with which the Royal Air Force can be justifiably satisfied. The efficiency and determination of the officers, non-commissioned officers and men were well tested, and I am proud to record that they were not found wanting.

TABLE SHOWING NUMBER OF PASSENGERS AND BAGGAGE EVACUATED.

Total number of flights made by aircraft	84
Number of passengers evacuated	586
Amount of baggage evacuated	24,193 lbs.
Total	92,482 lbs.

Types of machine employed : Vickers Victoria, Westland Wapiti, D.H.9A, Handley-Page Hinaidi.

CERTAIN LESSONS LEARNT DURING THE EVACUATIONS.

USE OF AIR POWER IMPERIALLY.—The outstanding feature of these operations is the fact that India was able successfully to draw upon Imperial air resources in Iraq to perform the task upon her own frontiers, and that Iraq, in turn, was able to supplement the temporary deficiency in her Air Force by drawing upon the Middle East Command. The task was a purely civil one, yet it provided the first opportunity in history for the mutual co-operation of different Air Commands of the Empire.

A situation, fraught with the gravest possibilities, developed with startling suddenness on the borders of India during December, 1928, and none of the accepted forms of intervention, diplomatic or military, could have liquidated the urgent position that arose.

SUDDEN DEVELOPMENT OF A DANGEROUS SITUATION.—The state of the civil war in and near Kabul might, at any time, have developed into uncontrolled massacre and chaos.

The first victims of such a situation might well have been the foreigners—colonies, traders, employees and the Legations.

The situation in Afghanistan during the latter part of December and the early part of January was fraught with potentialities so menacing that it could only be regarded with anxiety and alarm. Perhaps the most critical time of the period under review was immediately subsequent to the fall of the Arg, and prior to the safe removal by air of Inayatulla. The British Minister, in an official communication referring to this, used the following sentence :—

> " Through the instrumentality of the Royal Air Force, Kabul has been saved from a horrible tragedy."

METHOD OF PREVENTION.—The only solution of the problem was the removal of the foreign colonies whose safety was endangered. This was not feasible, except by the Royal Air Force. The compo-

sition of the Royal Air Force in India was unsuited to the demands of the situation, and it became necessary to draw on the nearest available source to fill the deficiency. These requirements were met by the Iraq Command, while the gap created in Iraq was filled with reinforcements from the Middle East Command.

THREE COMMANDS INVOLVED.—Thus, three Royal Air Force Commands, in three distant countries, India, Iraq and Egypt, were called upon to supply their quota towards meeting the emergency.

ECONOMICAL ASPECT OF THE EMPLOYMENT OF AIR POWER.—Air reinforcements were asked for in proportion as the urgency of the situation grew. A big concentration was required at the culminating evacuation, and it was only immediately prior to this climax that this concentration was effected. The great speed at which modern aircraft travel and the use of wireless, not only between Royal Air Force Commands, but between those Commands and aircraft in the air, enables a force to be assembled and rapidly withdrawn on the most economical basis.

ADVANTAGE OF HEAVY TRANSPORT MACHINES.—The advantages of heavy transport aircraft were clearly displayed. Not only had they the carrying power to transport personnel and stores from place to place at great speed, but they also have considerably greater endurance than the single engined machines. The fact that, apart from the Hinaidi, India possessed no heavy transport aircraft made it necessary for the Royal Air Force in India to call upon the heavy transport machines of Iraq. It was only by good fortune, however, that these could be spared. The uses of heavy transport aircraft are so many that they could be adapted to practically every difficult situation which may arise.

No one in the early days of December could have visualised the state of affairs which arose in Afghanistan in December and necessitated reinforcements of heavy aircraft from Iraq. Once difficulties of any nature arise, it is impossible to foresee clearly their solution beforehand. I am, however, strongly of the opinion that, as was proved in Afghanistan when heavy transport machines provided a solution of the difficulties, so in any other serious situation the possession of heavy transport aircraft by the Royal Air Force in India would be found to be invaluable.

GENERAL OBSERVATIONS AND RECOMMENDATIONS.

One of the principal difficulties connected with the conduct of operations of the nature described in this report is that of effecting the intricate arrangements required at the point of embarkation. To ensure success, efficient supervision is necessary of details, such as

landing signals, weighing and checking loads, the allotment of passengers and freights to aircraft, judgment of the suitability of weather conditions, the avoidance of delays in loading up, etc. I have no hesitation in stating that the success that attended these operations is largely due to the remarkably efficient organisation which was provided under Sir Francis Humphrys' direction at Kabul.

In spite of the difficult and delicate nature of the arrangements, in no single instance was there a defect or failure of any kind.

Moreover, in the early days when it was necessary for the Royal Air Force to open up communication with the Legation, the measures taken by Sir Francis Humphrys to signal to our pilots made the task of the Royal Air Force all the easier, and proved to them that the British Minister at Kabul clearly understood the difficulties of a reconnoitring pilot under such circumstances.

Value of the Mobility of the Royal Air Force.—An outstanding feature of the operations is the rapidity with which the Victoria aircraft were mobilised by the A.O.C., Iraq, Sir Robert Brooke-Popham, and despatched to India. As a demonstration of rapid reinforcement, the arrival of the aircraft in India two days after leaving Iraq provides a vivid illustration of the mobility of the Royal Air Force. It is also a striking testimony to the efficiency of the officers and men of No. 70 (Bombing) Squadron, under the command of Squadron-Leader Maxwell, M.C., A.F.C., and of the Victoria aircraft, that these machines were operated with unfailing regularity, some thousands of miles from their base, with practically no workshop facilities and only a handful of stores and spare parts, whilst their maintenance was carried out by the crews of the machines themselves almost without assistance. No shed accommodation was available at Risalpur aerodrome, and all the work of maintenance was carried out in the open and a great proportion of it after dark, often throughout the night.

The rapidity with which men were despatched over the frontier to provide assistance and succour to the officers who were forced to land in Afghanistan, and the knowledge that this assistance was always forthcoming, provided a sense of security which was an undoubted stimulant to the morale of the pilots and crews, who, as a daily routine, were carrying out long flights over turbulent and perilous country.

FORCED LANDING OF VICKERS-VICTORIA J.7926 IN AFGHANISTAN, 29TH JANUARY, 1929.

1st Pilot—Flight-Lieutenant R. Ivelaw-Chapman; *2nd Pilot*—Flying Officer A. R. S. Davies; No. 70 (B) Squadron, Iraq.

Towards the end of January, 1929, it was decided that a general evacuation of all Europeans and British Indians by air from Kabul should be undertaken by those machines of the R.A.F. that were "standing by"

at Risalpur with that object. Consequently, on the morning of the 29th of January, Davies and I left Risalpur Aerodrome in Victoria J.7926 *en route* for Kabul. The cabin was absolutely empty, and we had no kit of any sort with us except the flying clothing we were wearing and ten blankets for the passengers we expected to carry on the return trip.

For the first two hours all was normal and both engines were functioning well, but some 10 miles east of the Lataband Pass, while at about 3,500 feet, both engines started to "fade." Nothing I could do brought any improvement. The engines very soon got worse, and we were no longer able to maintain our height, so, realising that we could not now clear the Lataband, I turned north towards the Kabul River, losing height rapidly, in search of a flat piece of ground on which to land. Luckily, soon after we spotted what looked from the air to be a small area of flat surface and just managed to get down on to it, both engines having completely ceased to function while we were still in the air. In landing, the port undercarriage and port lower plane were damaged and the tail skid and skid-post broken. Neither of us was hurt except for a bruise on Davies' knee. I found we were on a small plateau roughly 60 yards square, undulating and strewn with small boulders, with a steep drop of about 200 feet on three sides and about two miles from the village of Sarobi.

From the air, the surrounding countryside had looked entirely deserted, but within a few minutes of landing we were surrounded by a seething mass of wildly shouting, heavily armed, excitable Afghans who surged round and in the machine and were raising a veritable babel in their highly pitched "Pushtu." Unfortunately, neither of us could understand that language, and I searched in vain for someone who understood Urdu. I produced our "ransom chit," but for some time there was apparently no one in the crowd who could read. They showed no outward sign of hostility and, as far as we could gather, they were making wild speculations as to our nationality when a man arrived, wearing a military greatcoat, who restored order, quietened the pandemonium, took over our ransom chit and generally took the situation in hand. We discovered two or three days later that this man was one Noor Mahomed Khan, a "Brigadier" in that part of the Royalist Army then loyal to Ali Ahmed Khan; he was apparently in the "Q" Branch, as he was out touring the villages to obtain forage and supplies for the main army. Unfortunately, however, he could neither speak nor understand Urdu, and for the first 36 hours that we were in Afghanistan all our conversation had to be in "sign" language, nor were we able to find out among which political faction we had fallen.

Noor Mahomed Khan was apparently satisfied with the contents of our ransom chits and led us off down the slope, under an armed escort, away from the machine over which he posted several sentries. On reaching the courtyard of a farmhouse at the foot of the hill, green tea and chupattis were produced for our consumption, what time Noor Mahomed Khan conferred with the elders of the village. As a result of the conference, a letter was written in Pushtu by Noor Mahomed Khan and despatched to a destination we were unable to discover. We were then searched and all our personal effects were taken over and shortly afterwards I returned to the machine, drained off the water and collected all the loose articles of value, bringing them back down below where they were checked together with our personal effects, listed and taken

into safe custody by Noor Mahomed. All these things were restored to us three days later with one or two exceptions. The remainder of that day and the night was spent in a windowless, mutty-walled outhouse about 12 feet square in company with an escort of from 10 to 12 Afghans, who appeared to be interested and friendly towards us once we had dispelled their suspicion of our Russian nationality and convinced them of the peaceful intent of our interrupted flight.

Early the following morning I got them to understand that I wanted to return to the machine where I removed the petrol filters from both engines to find 1½ inches of solid ice in each, thus establishing definitely the cause of the engine failure. I was also able to assure myself that the machine could never be flown off even were it possible to effect a repair.

Soon after, Noor Mahomed Khan's messenger returned with a reply to his chit of the previous day written in Pushtu with the exception of one line at the end which read:—

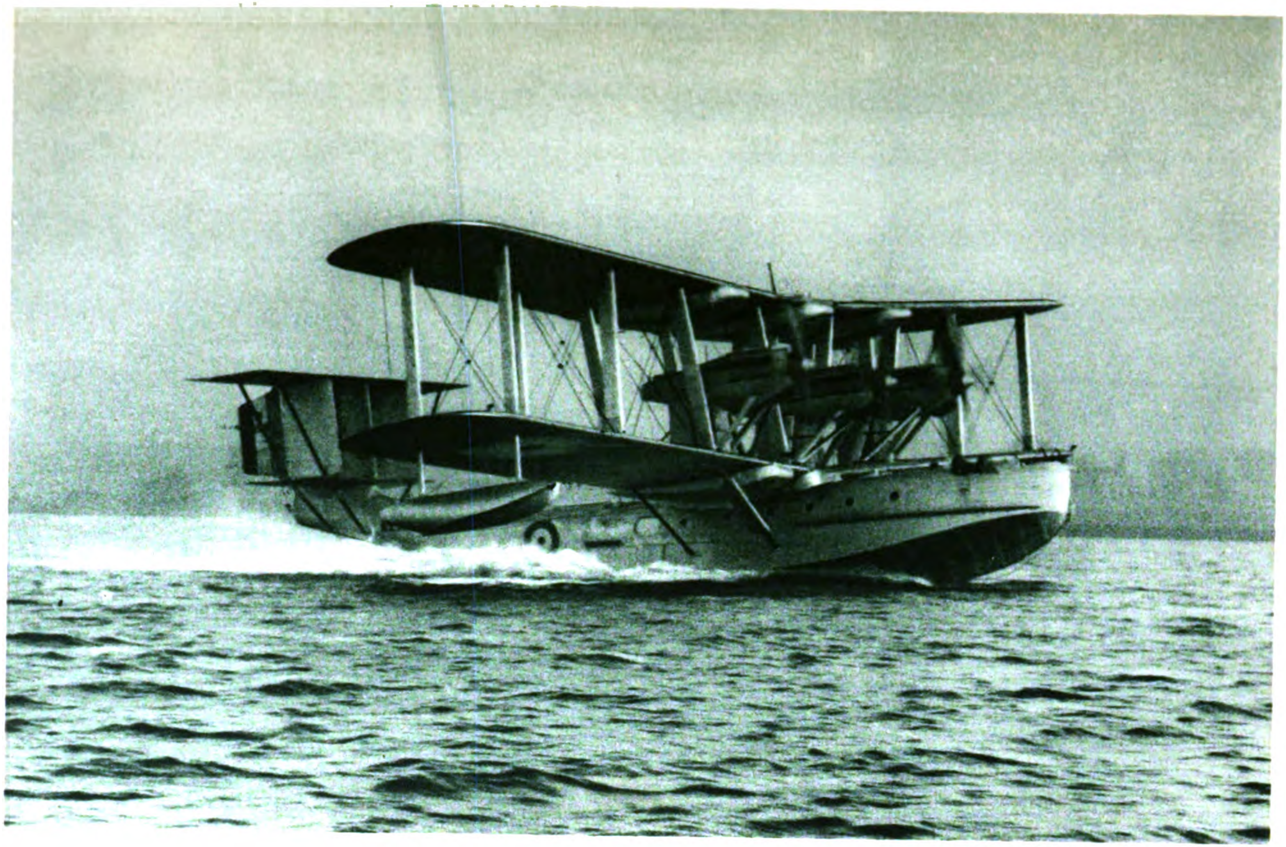
"Please come to Ali Ahmed Khan and be satisfied."

This at any rate was reassuring even if not explicit and we were quite glad to see "tats" being saddled and armed escort being prepared. We left Sarobi about an hour later after bidding good-bye to Noor Mahomed Khan. The leader of the escort and our two selves were mounted while our escort of 12 rifles were on foot. It was during this journey that we discovered that our destination was to be Jagdallak where Ali Ahmed Khan, later Governor of Jalalabad, was mustering a strong army to march on Kabul and overthrow Bacha-Saqao.

The journey that day, though only some 30-odd miles, was very tedious and tiring particularly for Davies who was in the saddle for eight hours almost continually with a knee which had swollen up badly during the night and must have been causing him considerable pain. The going was particularly bad—winding stony tracks partially covered in snow—the gradients were steep and the wind bitterly cold. The journey, however, went off without incident except in a small village just short of Jagdallak where a large crowd gathered and obstructed our passage; however, after a little time, our escort had convinced them of our British nationality and the nature of his mission, and we were allowed to proceed, being given a "Chupatti" each, presumably as a token of good faith. We reached Ali Ahmed Khan's camp at Jagdallak about 1800 hours and were welcomed by his second son, Noor Ahmed Khan, who spoke and understood English.

Ali Ahmed Khan's headquarters were in an old Rest House at Jagdallak on the main Khyber-Kabul road, and we were given a small room in it just large enough for two camp beds, two tables, and a couple of chairs. We were well treated on the whole and he did what he could to make us comfortable, but being himself on active service his resources were somewhat limited. Though very hospitable, he treated us strictly as political prisoners and it was difficult at first to discover his attitude towards us. A sentry was posted at our door and only on three occasions was I allowed to leave the room during the six days we were there; on those occasions I got out for a quarter of an hour's walk escorted by a couple of sentries. Davies, whose knee at that time would not allow of his walking, was not so fortunate.

Ali Ahmed Khan appeared to be very busy organising his army and



[Copyright Photo : Topical Press Agency

The Blackburn Iris III.

(THREE ROLLS-ROYCE CONDORS)

only sent occasional messages to us through his son. By him we were given to understand that they were very anxious to assure our personal safety and to secure for us an unmolested passage back to India. In fact, it was on this score apparently he detained us so long. On the third day we were told we would be sent on the morrow by road to the British Legation at Kabul, but this did not materialise for some reasons we were unable to discover. On the fourth day a Sowar sent out by the political agent, Khyber, arrived on foot from Jalalabad in search of us. This man's arrival brought a change in the plans of Ali Ahmed Khan as to our disposal, and he promised to send us by car to Jagdallak on the following morning, but we were again disappointed, as reports came through that the road was unsafe in the Gandamak area.

This Sowar, one of 20-odd sent out by devious routes in search of us by the P.A., Khyber, was a Landi Kotal Shinwari, a fine looking stalwart who knew the Afghan well and was therefore of great service to us. His presence in Jagdallak brought about a decided improvement in the conditions under which we lived.

On the fifth day a man came through on foot from Kabul with some cigarettes, some fruit, and a note for me from the British Minister, Sir Francis Humphrys. Despite his arrival, however, Ali Ahmed Khan maintained that the Jalalabad route was safer and accordingly on the morning of the sixth day we were ushered into the presence of Ali Ahmed Khan whom we then met for the first time. He assured us of his staunch friendship towards Great Britain in the past, present and future; he promised to keep a guard on our aeroplane at Sarobi; he gave us despatches for the Chief Commissioner, Peshawar, and for the Viceroy. He presented our Sowar from Landi Kotal with a Mauser automatic, and then bade us farewell. Outside the Rest House we found a "Chevrolet" van awaiting us and we took our departure in this, accompanied by a large armed escort including, of course, the Landi Kotal Shinwari.

It was a great relief to get out into the open again, and the first part of the journey through the Jagdallak Pass was most picturesque. The first hour or so passed without incident, but when the road left the pass we started to encounter small gangs of tribesmen at frequent intervals, all of whom stopped the car, but in each case one or another of our escort was able to establish friendly relations with the tribe in question, and the car was allowed to proceed. About three miles past Nimla, however, we were again stopped by roughly 200 armed tribesmen who immediately started a heated altercation with the leader of our escort. Apparently, they were definitely opposed to the Ali Ahmed Khan faction and considered that if anybody was going to be recompensed for our safe conveyance through their area, it should be they. The Indian driver was made to turn the van round in which we were still sitting, and face back towards Jagdallak. The argument then reached " concert pitch " and was intensified by a fevered dispute which broke out between the leader of Ali Ahmed Khan's escort and the Landi Kotal Shinwari. How the matter was eventually settled we never definitely discovered, but after two hours of continuous shouting the van was allowed to resume its original direction and we proceeded on our way, but I noticed that our party had been swollen by several of the tribesmen who had stopped us, and no doubt they were eventually rewarded by the British Consul at Jalalabad. This increased load—there were now 23 persons in the van made to carry 12—reduced our speed considerably, but the

rest of the journey to Jalalabad went off peacefully despite one or two false alarms and a barrier of boulders stretching right across the road and carefully placed just round a bend. At 1700 hours that evening, Monday, 4th February, 1929, we reached H.B.M. Consul, Jalalabad, Khan Sahib Mahommed Jehangir Khan. We learnt that the British Consulate had been forced to leave Jalalabad when the rebellion broke out in November of last year, since when it had been living under the protection of the Pir Sahib of Baghdad within the surrounds of his fort at Charbagh some six miles from Jalalabad, and it was at this fort that we joined the Consul. He soon made it clear to us that it was not safe for us to proceed any further by car, and that for the time being, at any rate, we should consider ourselves the guests of the Pir Sahib who would extend his hospitality to us.

The Pir Sahib put his guest tent at our disposal and was most generous, hospitable and thoughtful throughout our fortnight's stay at Charbagh. The tent was pitched within the surrounds of his fort, and in addition we were given the run of two large orange-grove gardens adjacent to his fort in which we spent most of our time. Whenever we went outside these limits we were always accompanied by two or more servants of the Pir Sahib, whose position as a " Spiritual Director " gave him vast influence in the neighbouring countryside.

On the morning following our arrival, I discussed the situation with the Consul who was again very definite in his opinion that the Jalalabad-Khyber road was not safe, and was not likely to become so for some considerable time. Finally, at his suggestion, the Pir Sahib lent me a horse and I rode out into the country in search of a possible landing ground as close as possible to the Pir Sahib's immediate sphere of influence. The Consul was convinced that Jalalabad aerodrome was unsafe, moreover he assured me that our evacuation to India could only be effected safely by air.

After a long search I selected what I considered to be the only plot of ground within three miles of the fort which would in any way lend itself to the purpose. With labour, offered by the Pir Sahib, I decided that it could be made fit in four days for a " Victoria " or " Hinaidi," though not for a single engined machine. That evening I wrote a lengthy letter to the Chief Commissioner, Peshawar, describing the situation fully and enclosing a detailed report as to the site, nature and the limitation of the landing ground, and suggesting that either a Victoria or Hinaidi should come over on the following Sunday and take us away. This letter, together with some consular despatches, were sent off to Peshawar by a special messenger on foot on the morning of Wednesday, 6th of February, all normal methods of communication having lapsed since the outbreak of the rebellion.

During the next few days all large boulders and sand heaps were removed from the landing ground by local labour while I rode out each evening to watch the progress. By the Saturday evening I was quite satisfied that the ground was fit for either of the machines I had mentioned in my letter.

In the meantime we learnt that Ali Ahmed Khan's camp at Jagdallak had been looted four days after we had left, the Rest House burnt and Ali Ahmed Khan himself only escaping by disguising himself as a Mullah and getting away into the hills. The cause of his undoing was the combined tribes of Shinwaris and Khogianis who had marched into his

camp in full strength, ostensibly to give their allegiance to his cause, and had then proceeded to loot him.

On Sunday morning early—the 10th of February—the two of us and an escort rode out to the landing ground half an hour before the pre-arranged time and awaited the arrival of the machine. To our surprise, two Bristol Fighters and a D.H.9A appeared, and one of the former detached itself from the formation and unfortunately attempted to land. The undulations of the landing ground, however, as I had feared, proved too much for its tail skid which collapsed and in so doing broke the skid-post and fuselage cross members and damaged the lower fin, tail-plane bracing and lower half of the rudder. It was obvious at once that it could not fly again that day so, on the advice of the Consul, the two of us and Hancock, the pilot of the Bristol, left the large crowd that had collected round the machine, leaving Pir Sahib's men on guard, and rode back to the Fort to discuss the situation and to get off another letter to Peshawar explaining what had happened.

Within an hour of Hancock's landing, the Shinwaris and Khogianis followed up their coup at Jagdallak by entering Jalalabad, ousting the garrison and then proceeding to loot the city. This was fortunate for us, as this new diversion proved too much for the enormous crowd gathered round the Bristol, and so, on our return about midday, we found the machine practically deserted, thus enabling us to make a thorough examination of the damage undisturbed. We had brought back with us the Pir Sahib's head carpenter, a skilful tradesman, who made most ingenious use of the few primitive tools he possessed. We explained to him what we wanted in the way of a new fuselage cross-member, and he set about, there and then, to make one while Hancock and I continued to dismantle all the broken parts and devise schemes for their repair.

Towards evening, when everything was going well, our work was suddenly curtailed by an inter-tribal fight over a small matter of loot which had been waging in the distance for some time, but was now moving rapidly nearer. We took shelter temporarily in a neighbouring fort and from that point of vantage watched the scene of battle ominously close to the Bristol, till at one time some of the tribesmen were sheltering behind the fuselage while the shots from their opponents were hitting the ground dangerously close to the machine. When the fighting was over we were advised not to return to the machine and so made our way back to the Pir Sahib's sanctuary just before dark. During the afternoon, whilst still working on the machine, Jalalabad arsenal was blown up by a time-fuze left by the Royalist garrison. It went up with a tremendous explosion sending up an enormous "mushroom" column of black smoke 4,000 feet in the air, and killing, we were told, 800 of the looters. The city was set on fire, and that night the red glow in the sky, reflected from the burning city, could be seen for miles around.

The following morning we went back to the machine which, to our surprise, had not suffered in any way from the previous day's fighting We were able to work there the whole day undisturbed, as the scene of the fighting over the Jalalabad loot had moved nearer to the city. By the evening I had decided that we could effect a satisfactory, though temporary, repair to Hancock's Bristol with the material available, and estimated that if we were left unmolested we could get the machine off with Davies in the back seat by the next afternoon.

Hancock and I went out to the landing again early the next morning and by one o'clock we had completed our job. We then moved the machine to a suitable patch of ground for a "take-off" and sent a messenger back for Davies. He arrived about three, and shortly afterwards he and Hancock left by air for Peshawar which they reached safely an hour and a half afterwards.

I was greatly relieved to get Davies back to India, as his knee, which required medical attention, had been causing me some anxiety during the past few days. He took with him a letter from me asking for another Bristol to come over on the following Monday—the 18th—while I undertook in the meantime, with the help of local labour, to level completely a strip of ground in the middle of the original landing ground and clear it of all stones, generally making it fit for a Bristol to land on.

Throughout the remaining five days there was almost continuous inter-tribal warfare in the Jalalabad district, mainly on the question of loot, interfering seriously with the work on the landing ground. It was also the month of Ramzan which materially affected the output of labour in so strict a Mohammedan country as Afghanistan, and so I was glad that, on the Consul's advice, I had allowed a large margin of time for the work which was not completed to my satisfaction till late on the Sunday evening, the 17th. On Monday morning, at exactly the prearranged hour, Hancock again came over in a Bristol. He made a perfect landing, using only half the strip that we had prepared. My kit was bundled in, I bade farewell to the Consul and we were off the ground again within five minutes, arriving back at Peshawar about 11 a.m. on 18th February, 1929, exactly 20 days after I had left Risalpur.

The three weeks we spent in the country were most interesting and we were particularly fortunate in being so well treated and cared for, especially at Charbagh. We very soon got accustomed to the native food, and, apart from Davies' knee, we both managed to keep very fit. The local villagers round Charbagh and all the refugees and staff of the Pir Sahib's sanctuary were most helpful, friendly and respectful. We were even able to borrow an English book, a Kipling, from the Consul's head Indian clerk. The only privation we felt, of course, was the lack of kit, particularly razors, tooth-brushes and soap, commodities apparently unknown to the Afghan.

In conclusion I would like to pay a strong tribute of appreciation to the Pir Sahib of Baghdad, not only for the protection he afforded us, but also for his generous hospitality and his thoughtfulness for our welfare. Though 80 years of age, he took a most active interest in the progress of events, and it was entirely due to him that our evacuation by air became a feasible proposition.

I would also like to mention the name of Mohammed Afzal Khan, head clerk to the Jalalabad Consulate, who acted as our interpreter and gave me invaluable assistance in the clearing of the landing ground and the repairing of the Bristol. He was an indefatigable, cheerful worker of outstanding intelligence.

(Sd.) IVELAW-CHAPMAN, *Flight-Lieutenant,*
Royal Air Force.

Risalpur,
23rd February, 1929.

A NAVAL MISCELLANY

By Our Naval Correspondent.
(Captain Taprell Dorling, D.S.O., R.N.)

Naval Disarmament.

The Prime Minister's recent visit to the United States, and the Five Power Naval Conference to be held in London in January, which will be attended by delegates from the British Empire, the United States, France, Italy, and Japan, have caused the question of naval disarmament again to become a matter of topical interest.

Total disarmament—that is, the entire abolition of all naval, military, and air forces designed to be used for war purposes—is never likely to be a matter of practical politics. Partial disarmament compatible with security can, however, be effected by international agreement.

The Hague Conference.

During the period preceding the World War, various attempts were made to reduce the burden of armaments. The two Hague Conferences of 1899 and 1907, however, failed to achieve this object. No general agreement was reached, and during the years before 1914 all the more powerful nations spent an ever-increasing proportion of their national wealth on the production of huge fleets and armies.

While the Hague Conferences failed in their main objects of diminishing the prospect of war, however, efforts were made to mitigate its horror by laying down definite rules for its conduct.

A number of Powers, Great Britain included, not only bound themselves to refrain from " the discharge of projectiles and explosives from balloons or by other new methods of similar nature," but agreed not to permit the bombardment " by whatever means " of undefended places, thus precluding the dropping of bombs by aircraft upon such places, as well as the use of artillery. The use of expanding bullets, and the employment of projectiles where the one object was " the diffusion of asphyxiating or deleterious gases " were also forbidden. There was no discussion as to the legitimate use of submarines in war, since submarines at that time were still in their infancy and were regarded as defensive weapons of rather doubtful utility. Within ten years, however, the unrestricted use of submarines in a manner contrary to the generally accepted rules of war was to prove a very potent weapon in the hands of Germany.

Practically every one of the enactments which were ceremoniously agreed to and signed at the Hague Conference was ruthlessly violated during the World War.

No nation fighting for its existence is likely to neglect possible methods of winning a war, even though such methods may be forbidden by previous international agreement. In short, hard and fast regulations for its conduct are to be deprecated, and what legislation is necessary should be based upon broad guiding principles rather than upon exact

rules which may be evaded, or may not be applicable in a few years' time. Weapons, and the means of using them, are constantly changing.

Partial disarmament by international agreement—disarmament, that is, compatible with security—is quite another matter. Heavy armaments undoubtedly encourage war, and the history of the twentieth century has shown that if war is prepared for, war will indubitably come; that the increase of armaments in one country will provoke similar increases in another; and that if this rivalry continues war is a foregone conclusion. "Si vis pacem, para bellum" is too dangerous a motto to a country that really wants peace, and, as Lord Grey once observed, "If civilization cannot destroy armaments, armaments will destroy civilization."

The League of Nations.

It was for the express purpose of making wars less likely that the Covenant of the League of Nations was embodied in the Peace Treaties of 1919. And in Article 8 of the Covenant, the members of the League recognized "that the maintenance of peace requires the reduction of national armaments to the lowest point consistent with national safety and the enforcement by common action of international obligations."

The Washington Conference and Treaty, 1922.

The United States, however, though then the second strongest naval power, was not a member of the League of Nations, and is unlikely ever to be. Nevertheless, she did not hold herself aloof from the subject of disarmament, for, in July, 1921, President Harding issued invitations to the British Empire, France, Italy, and Japan to attend a conference at Washington on the subject of limitation of national armaments, "in connection with which Pacific and Far Eastern questions could also be discussed." For this latter purpose, China, Belgium, Holland, and Portugal were also invited to send delegates.

We need not enter here into the two Nine Power Treaties dealing with affairs in the Far East which came to be signed as a result of the Washington Conference. What principally concerns us is the Washington Treaty for the limitation of naval armaments which was concluded on February 6th, 1922, between the British Empire, the United States of America, France, Italy, and Japan.

It is unnecessary to go into great detail. Briefly, however, the five Powers concerned agreed to retain only the "capital ships" specified in the Treaty, all others being scrapped. (The term "capital ships," or, as we should now call them, "heavy ships," referred, of course, to battleships and battle cruisers.)

The heavy-ship strength of each Power was also rationed by standard displacement—the British Empire and the United States each limiting themselves to a total of 525,000 tons; France and Italy each to 175,000 tons; and Japan to 315,000 tons. At the same time, it was agreed that no ship built in the future should exceed 35,000 tons, while no gun larger than a 16-inch was to be mounted in them. Heavy ships could be replaced twenty years after their date of completion, or, in the event of loss or accidental destruction, at once.

Aircraft-carriers were defined at the Conference as vessels of over 10,000 tons displacement "designed for the specific and exclusive use of carrying aircraft" and so constructed "that aircraft could be launched

therefrom and landed thereon." The total tonnage in ships of this category allowed to each of the Powers was: The British Empire and the United States, each 135,000 tons; France and Italy, each 60,000 tons; Japan, 81,000 tons. There was a proviso, however, that all aircraft-carriers built or building on November 12th, 1921, should be considered as experimental, and could be replaced within the total tonnage built irrespective of any age limit. The normal period after which other aircraft-carriers might be replaced was, like heavy ships, twenty years from their date of completion.

No new aircraft-carriers built or acquired in the future were to exceed 27,000 tons displacement, though each of the Powers might build two such vessels of not more than 33,000 tons, provided the total tonnage allowance was not exceeded. For the sake of economy, vessels built or building which would otherwise have been scrapped might be used for this purpose.

The gun armament of aircraft-carriers was limited to ten 8-inch. If, however, the armament contained no gun larger than a 6-inch, then their number was not limited. In either case there was no restriction on the number of anti-aircraft guns and guns not larger than 5-inch.

The Washington Treaty laid down no limits as to the total number of cruisers allowed each Power; but did lay down that no ships-of-war other than heavy ships and aircraft-carriers should exceed a displacement of 10,000 tons, and that no guns larger than 8-inch were to be mounted in them.

No limits as to the number, size, and individual armament of destroyers was decided, while, though the British delegates pressed for the total abolition of submarines, and the Americans proposed a reduction in total tonnage, other Powers would not agree, as they regarded under-water craft, legitimately used, as economical units in their systems of maritime defence which they could not afford to be without.

The Washington Treaty, though regarded with horror by many of the older school of naval officers, in that it reduced the hitherto pre-dominant British Navy to a position of equality with that of the United States, went a long way towards putting a stop to any competitive race in naval armaments. It definitely laid down the ratios of 5—5—3 for the heavy ships and aircraft-carriers of the British Empire, the United States, and Japan, and by limiting the size of future vessels, and their armaments, conduced to national economy. All the five Powers concerned, moreover, were immediately able to scrap a considerable number of vessels.

Geneva Conference, 1927.

The question of the number of cruisers, however, still remained unsettled, and at a further Naval Conference which started at Geneva on June 20th, 1927, which was attended by the British Empire, the United States, and Japan, with France and Italy as interested onlookers, the British delegation brought forward further proposals.

Their main suggestions were that the life of heavy ships should be increased from twenty to twenty-six years, with a corresponding fixing of life for other vessels; that the size of individual heavy ships should be reduced from 35,000 to something under 30,000 tons; and that 13.5-inch guns should be mounted instead of 16-inch. They further proposed the extension of the existing ratio of 5—5—3 to the 10,000-ton cruisers

armed with 8-inch guns allowed to Great Britain, the United States, and Japan, and that, after the stipulated number of 10,000-ton cruisers had been decided upon, all future vessels of this type should be 7,000-ton craft with 6-inch guns. Great Britain, moreover, would prefer to see submarines abolished; but, failing that, suggested that the largest submarines should be limited to 1,600 tons, the smaller type to 600 tons, and that the armament of each should consist of nothing larger than 5-inch guns.

We need not go into details, but Britain and the United States soon found themselves hopelessly divided on the question of cruisers, the former insisting that she must have "security," while the United States required "parity." Though each side in theory conceded the claims of the other, it proved impossible to evolve a scheme to satisfy both. By "security" Great Britain meant a force sufficient to protect her trade routes all over the world, and asked for seventy cruisers of 7,500 tons. By "parity" the United States meant freedom to build up to the same total tonnage as Britain in cruisers of whatever size and armament she pleased up to the 10,000-ton craft with 8-inch guns allowed by the Washington Treaty. Great Britain objected, for she considered her security would be threatened if the United States built more than a very limited number of the larger cruisers. America would not give way, and a deadlock was reached.

After three weeks of discussion between the committees, the First Lord of the Admiralty, Mr. Bridgeman, suggested that the United States and Great Britain should each have twelve 10,000-ton cruisers. This was refused by the United States, which declined also to agree to the drawing up and signature of a formal document embodying the points upon which agreement had been reached, such as the limitation of destroyers and submarines. The Conference terminated on August 4th without result, Great Britain considering that the United States required too many large cruisers, and the United States considering that Great Britain wanted too many small ones.

The Prime Minister's Visit to the U.S.A., 1929.

It was this difference of opinion, coupled with his natural desire for world-wide peace and further naval disarmament, which induced Mr. MacDonald to visit the United States.

His statement explains itself. "I went out," he said to the House of Commons on November 5th, "not as a party leader, but as a national representative. I went out with no draft agreement, either in my mind or in my pockets," he continued. "I went to try by personal contact and by direct address to establish a new relationship between the two peoples, a relationship based upon mutual understanding not only of common objects to be pursued, but of natural differences to be respected, but I must leave the result to fructify in policy and action as time goes on. The breeze which blew me across the Atlantic was created by the conversations I had had during the summer with the American Ambassador, who personifies in such a delightful way the downright desire of his Government for peace and good will. These conversations had already removed any fear that at an international conference the unbridged differences between the United States and ourselves would doom such a conference to failure. I reviewed these conversations with the

President, and studied with him ways and means of filling in the narrow gaps still remaining in a programme of building which should at the same time recognize both parity and strength and variety in the use of tonnage. Both of us recognize, however, that the agreement we were seeking was not merely one between ourselves, but one which would have to be set into a wider co-operation, and that a final settlement would have to depend upon the Five Power Conference, invitations to which we learned during our deliberations had been accepted by all the Powers concerned."* Later in his speech, the Prime Minister observed, "We approach old historical problems from a new angle, and in a new atmosphere, on the assumption that war between us is banished and that conflicts between our military and naval forces cannot take place."

Meanwhile, we await with interest the results of the Five Power Naval Conference which will take place in London in January. In some quarters we are informed that we may expect a further reduction in the numbers, size and armament of heavy ships; limitations in the numbers of large and small cruisers, as well as in the numbers and size of destroyers and submarines. But with the requirements of five different Powers to be considered, and so many conflicting interests at stake, it is idle to prognosticate.

To the several nations of the British Empire, however, scattered all over the world and linked together by the sea, naval security is of vital importance. This applies particularly to cruisers for trade protection, the sea routes, or maritime lines of communication, being the vital arteries through which flows the life-blood, not only of Great Britain, but also of every self-governing Dominion and Crown Colony in the far-flung British Empire. In peace, moreover, cruisers are the safeguards of civilization in the uttermost parts of the earth, the maritime police force of the world. But for their presence piracy, gun-running, the slave traffic, and other evils would again assert themselves.

President Hoover's Address, November 11th, 1929.

President Hoover's address at the celebration by the Veterans of the American Legion of the eleventh anniversary of the Armistice, is a document of the highest importance. It outlines the policy which the United States will follow, and the procedure to which she will consent, for the organization and maintenance of peace throughout the world, and offers for the consideration, primarily of the British and American peoples, the suggestion that ships carrying foodstuffs should be made free of interference in time of war.

The text of the speech is too long to be quoted in full, but the following passages deserve to be carefully read:—

"I am going to have the temerity to put forward an idea which might break through the involved legal questions and age-old interpretations of right and wrong by a practical step which would solve a large part of the intrinsic problem. It would act as a preventive, as well as a limitation of war. I offer it only for the consideration of the world. I have not made it a Governmental proposition to any nation, and do not do so now. I know that any wide departure from accepted ideas requires long and searching examination. No idea can be perfected except upon the anvil of debate. This is not a proposition for the forth-

* Great Britain, The United States, France, Italy, Japan.

coming Naval Conference, as that session is for a definite purpose, and this proposal will not be injected into it.

"For many years, and born of a poignant personal experience, I have held that food ships should be made free of any interference in times of war. I would place all vessels laden solely with food supplies on the same footing as hospital ships. The time has come when we should remove starvation of women and children from the weapons of warfare.

"The rapid growth of industrial civilization during the past half century has created in many countries populations far in excess of their domestic food supply, and thus steadily weakened their natural defences. As a consequence, protection for oversea or imported supplies has been one of the most impelling causes of increasing naval armaments and military appliances. Again, in countries which produce surplus food, their economic stability is also to a considerable degree dependent upon keeping open the avenues of their trade in the export of such surplus, and this again stimulates armament on their part to protect such outlets.

"Thus the fear of an interruption in seaborne food supplies has powerfully tended towards naval development in both importing and exporting nations. In all important wars of recent years, to cut off or to protect such supplies has formed a large element in the strategy of all combatants. We cannot condemn any one nation. Almost all have participated in it. The world must sooner or later recognize this as one of the underlying causes of its armed situation, but, far beyond this, starvation must not be included among the weapons of warfare."

The President's proposal, if ever adopted, would react both to the advantage and to the disadvantage of the British Empire in the event of any future maritime war. It would make it impossible for the inhabitants of this country ever to be starved into seeking terms by the interruption of their essential foodstuffs, as was so nearly the case during the intensive and unrestricted submarine campaign of 1917. At the same time, it would deprive the British Empire of one of its most potent weapons, that of starving an enemy into submission by maritime blockade.

While the sentiment of "sparing the women and children" is a laudable one which appeals strongly to the sense of chivalry inherent in the English-speaking peoples, it is difficult to see how it could ever be carried out in practice. As already pointed out, wars are fought by entire nations, not merely by their armed forces. Moreover, there are many foodstuffs capable of use in the manufacture of munitions, and it is manifestly impossible to guarantee that their import would not be diverted from the feeding of the civilian population to the production of munitions or the feeding of armed forces. Also, if the principle were to be applied to sea warfare, similar steps should clearly be taken in regard to the passage of food for the civilian population across the land frontiers of warring nations, and through the lines of an army besieging a fortified town.

To permit belligerent nations thus to be fed would inevitably prolong wars, while, in the words of the *New York Times*, the asking of a belligerent to grant free passage to food is "very like asking the commander of an army not to attack the communications or commissary supplies of hostile troops."

The *Baltimore Times* raises another point. "If two nations go to war and the Council of the League declares one of them the aggressor,

what shall we do under the Kellogg Pact? Should we in any case trade with that nation and thus enable it to carry out an unjust war? If we refuse to trade, shall we carry the refusal to the point of stopping the movement of foodstuffs and thus punish the women and children of the offending nation? "

The practical application of President Hoover's humane proposal bristles with difficulties. It is an academic proposal, which, like the various limitations in war proposed by the Hague Conferences of 1899 and 1907, seems foredoomed to failure when thoroughly explored and investigated. As has already been pointed out, no nation fighting for its very existence would be likely to neglect the most potent weapon of starvation in war, for the sake of an agreement entered into during peace to ensure the well-being of a hostile civilian population.

Atlantic Fleet Autumn Exercises.

As has been the case in previous years, the Atlantic Fleet spent the last fortnight in September and the first three weeks of October exercising in northern waters, the Cromarty Firth being used as an anchorage. There were present the battleships *Nelson* (Fleet Flagship), *Emperor of India* and *Marlborough*; the battle cruisers *Renown*, *Repulse* and *Tiger*; the aircraft-carriers *Furious* and *Argus*; the Second Cruiser Squadron; two destroyer flotillas; four submarines; and the wireless-controlled target vessel *Centurion*, together with the other vessels of the fleet target service.

No very ambitious strategical or tactical schemes were carried out, the period being primarily set apart for intensive squadron, flotilla, and single-ship practices which cannot be fitted in at any other time of the year. The Moray Firth, it should be said, provides a wide stretch of water more or less free from traffic, where day and night exercises and firings can be carried out without much chance of interruption.

The programme was a very full one, and included day and night firings at the *Centurion*, submarine attacks on heavy ships, anti-submarine exercises, torpedo and anti-aircraft practices, with, of course, intensive flying exercises from the two aircraft-carriers. As usual, the old war aerodrome at Novar was temporarily commissioned for the accommodation of machines from aircraft-carriers.

The weather on the whole was not good. During the fortnight I was with the fleet gale succeeded gale with monotonous regularity, which at times rather upset the programme and made it inadvisable for aircraft to be flown off and on the carriers.

The First Lord of the Admiralty, Mr. A. V. Alexander, arrived on board the *Nelson* on October 8th, and remained until the 13th. On the night of his arrival he witnessed a spectacular full-calibre shoot from the *Nelson*. Next morning, after a submarine attack, the Flagship was subjected to air attack.

It was a cold, blustery day with considerable wind and sea. We first saw seventeen aeroplanes in three groups looking like midges against the sky to the northward. They were presently joined by others. They approached rapidly, and while a couple of machines detached themselves and laid a white smoke curtain to port, a flight of Flycatchers in close formation dived straight at the ship, roared over the forecastle and bridge structure at a distance of what seemed little more than 40 feet,

and then wheeled and came at us again, apparently missing our towering mainmast by a matter of a few feet. Even to one not altogether unaccustomed to these displays of airmanship it was thrilling to see them, though, like watching a trapeze act at a circus, my heart was sometimes in my mouth. But there was not much time to think, for through the smoke curtain to port, flight after flight of torpedo-bombers came diving steeply down from the sky, broke their formation, and dropped their torpedoes at a height of a few feet above the water. The grey-green sea became criss-crossed with whitened tracks of torpedoes, many of which hit. Again, it was thrilling to watch, and though, if it had been the real thing, some of those attacking machines might have been brought down by our own fighters and anti-aircraft gunfire, it gave one an uncomfortable feeling to see torpedo after torpedo driving home.

On Thursday, October 10th, the First Lord went to sea in the *Furious* to witness flying exercises. After inspecting the hangars, he saw machines of all types carried flown off. While some machines carried out a practice reconnaissance flight, others carried out a torpedo attack on the ship. Next came a dummy attack with flourbag bombs on the *Furious*, the machines diving down at a steep angle and flattening out to pass with a roar within 20 or 30 feet of the flying deck. Not realizing that even small flourbags were tolerably dangerous missiles when travelling at something like 200 miles an hour, I was watching the proceedings from the open. It was not until one struck and burst within a few feet with a heavy thud that I realized it was advisable to take cover. Another item on the programme was a bombing attack upon a target towed by the ship, though perhaps the most spectacular display of the whole forenoon was an exhibition of aerobatics by the Flycatchers of No. 405 Flight. It brought a thrill to one's heart to see them looping in formation with their wing-tips nearly touching, banking steeply over and apparently standing on their tails, as they carried out an evolution known as "The Prince of Wales's Feathers." Altogether, for one who is not an airman, it was a most spectacular and thrilling forenoon without a dull moment.

It is not the first time I have seen the work of an aircraft-carrier at close quarters, but again I was greatly impressed by the rapid flying off and on with a complete absence of flurry or excitement; the calm earnestness and keenness of the personnel of both the Royal Navy and the Royal Air Force concerned; and by the youth, immense vitality, and obvious love for their work on the part of pilots and observers of both Services.

As is always the case in aircraft-carriers, 70 per cent. of the pilots were naval officers holding temporary commissions in the R.A.F., while the remaining 30 per cent. belonged to the Royal Air Force. The observers were naval officers and the telegraphists naval ratings. The deck landing party were partly naval, partly R.A.F., and again I was afforded an excellent example of seeing close co-operation and good team work with the two Services working side by side. Of the months of preparatory organization and minute study of detail I am not in a position to speak, though it is obvious that the success of an aircraft-carrier depends not merely upon her flying personnel, which represents a very small proportion of her complement, but upon every officer and man on board who, in one way or another, is involved in her operation. Especially important is the work of those in the engine and boiler rooms, who are called upon for drastic changes in speed at the shortest notice.

[" *The Times*," *Copyright*.

The Crescent and Star.

During the visit of a British Naval Squadron to Constantinople, pilots of the Fleet Air Arm, operating from H.M. Aircraft-Carrier "Courageous," gave a display over the city. At the conclusion the machines flew, as shown in this picture, in the formation of the Crescent and Star, a compliment to Turkey which evoked great enthusiasm.

It is no rare thing for speeds to alter from 6 to 29 knots in five minutes, and down again.

But I shall have to learn a new language. The jargon of the Fleet Air Arm is completely bewildering.

Air Display over Constantinople.

On October 18th, the pilots of the Fleet Air Arm from H.M.S. *Courageous*, which was visiting Constantinople with the *Queen Elizabeth*, the Flagship of Admiral Sir Frederick Field, gave a display of flying over that city. It was the first occasion upon which aeroplanes from an aircraft-carrier have provided such a display for the benefit of a foreign Power.

The *Courageous* proceeded into the Sea of Marmora early in the morning, and at 10 a.m. the first aeroplanes appeared over Constantinople. They comprised nine Darts, torpedo-bombers; twelve Flycatchers; and nine Fairey IIIF's. Flying in three formations over the Galata Tower at heights of 2,000, 2,500 and 3,000 feet, the machines then recrossed in squadron formation, next in V formation, and finally in line abreast, with only a few yards between their wing-tips. At 10.15, the Darts formed a large circle through which the Flycatchers corkscrewed downwards, after which three Flycatchers, led by Flying-Officer G. H. Birley, gave a display of aerobatics.

The thirty machines then reassembled, and, after forming flights in line astern, made slow dives over the Golden Horn before flying past the *Queen Elizabeth*. The last item of the programme was entirely novel and most impressive. The Crescent and Star of Turkey was formed in the sky, one machine representing the Star, and fifteen the Crescent. Assuming this formation three miles away, the aeroplanes flew over the city and finally disappeared over the Asiatic shore on their way back to the *Courageous*. Their original display, and the compliment to Turkey, aroused the greatest enthusiasm among the huge crowds of spectators.

On the following day, October 19th, over 100 Turkish officers, with foreign naval and military attachés, boarded the *Courageous* to witness an excellent exhibition of trick and formation flying, together with mimic air attacks upon the ship with machine guns and torpedoes.

Singapore Base.

In reply to a question in the House, Mr. Alexander, First Lord of the Admiralty, said that the decisions of a Naval Conference which was to take place in January " might affect the question of the use of this Base and in all the circumstances the Government had decided that work already contracted for at Singapore should be slowed down as much as possible, that all work that could be suspended should be suspended, and that no new work should be embarked on pending the results of the work of the Five Power Conference."

SOME EXPERIENCES IN THE HIGH-SPEED FLIGHT, 1929

BY SQUADRON-LEADER A. H. ORLEBAR, A.F.C., *p.s.a.*

INTRODUCTORY.

BEFORE one can discuss the events of the last Schneider Trophy contest, it is necessary to review briefly the position before the training commenced of the Service personnel that was to take part.

In 1927, for the first time the Royal Air Force became a competitor, and a team was trained. No really high-speed work had been done in the Service before, and that team had to gain its experience on an assortment of seaplanes which had been built for previous contests by private enterprise, for the S.5's and Gloster IV's had to be dispatched to Venice as soon as their airworthiness had been proved. The team, however, gained a brilliant victory and was then disbanded, though early in 1928 poor Kinkead returned to Calshot with a few men for his disastrous attempt on the speed record.

In the summer it was decided to make another attempt on the record. In the meantime, the Gloster IV's had been altered to give the pilot a better view. Greig was selected for the task, and, though he beat the existing world record of 318 m.p.h., his speed of 319 m.p.h. was insufficient to rank as a new world record.

Atcherley, Stainforth and I were then sent to join Greig at Calshot. However, this was a bad time of year to start a special organization, so the High-speed Flight was not re-formed till February, 1929.

SELECTION OF PILOTS.

It may seem rather curious that none of us had ever before been seaplane pilots. There is, however, little similarity between piloting the racing aircraft and piloting the ordinary Service seaplane. The latter is a long-distance aircraft and so, big and clumsy, with a reasonably slow speed in landing. Racers, on the other hand, are bound to be light and nippy, and they require such a lot of room to land that even a big water space seems quite small; nor do they like to be put down till they have quite finished flying: and this is the very thing a land pilot is taught, whilst a seaplane pilot with the big

space available has no cause to study this. To a pilot, therefore, who has flown fast single-seaters and has landed them on the limited space of an aerodrome, the racer is likely to appear more comfortable than to a pilot who has had almost unlimited space to land a slow and solid seaplane.

Personnel.

In January a start was made to form the flight at Felixstowe, where Waghorn joined us, and on February 1st we settled down to training. We had Moon as engine officer, general factotum, and host of the Mess, as we all knocked off alcohol. We had, too, about a dozen men of the old crowd, and round them we collected about another two dozen to keep us going: and right nobly they and Moon played their parts.

Atcherley and Stainforth had by now flown the Glosters a little, and of course Greig had flown both S.5's and Glosters. We started by way of a dual-control Service seaplane, to see what water was like to move about on, and then got used to it on a flycatcher with floats.

Physical Training.

As I have said, we knocked off alcohol, and this presented no great difficulty, as two of us were teetotallers and the other three were generally abstemious. Three were already non-smokers, and so suffered no hardship in that direction; Greig went on with his two or three a day at his own discretion, and I knocked down from twenty or more to not more than a dozen a day.

We were fairly free and easy about it all, because the medical view was that the Service had not done enough high-speed flying for them to know definitely what was specially necessary, and that, if we kept fit, we should not go far wrong; and we were the best people to decide how to do that. We had no preliminary medical examination, though no doubt they looked up our records, and we had no special diet or physical training. We just kept mentally and physically fit by not hanging round more than necessary when the weather was unfit and by taking exercise without making a fetish of it. In other words, we did not fuss.

Taxi-ing.

The next step in training was taxi-ing the Glosters to get the feel of high speed on the water. A seaplane has two distinct phases in the take-off, the first while she is held up by the buoyancy of the floats and the second when she is supported by the floats hydroplaning. The first phase is not much fun in a high-speed machine, for the controls have not become effective, and the machine feels even a small

sea, and any green water thrown up on the nose of the floats hits the propeller with a nasty jar and is deposited in the form of a shower-bath over the fuselage, including the cockpit and the back of the pilot's neck. However, that is usually soon over, and from 30 to 90 m.p.h. the machine runs very comfortably.

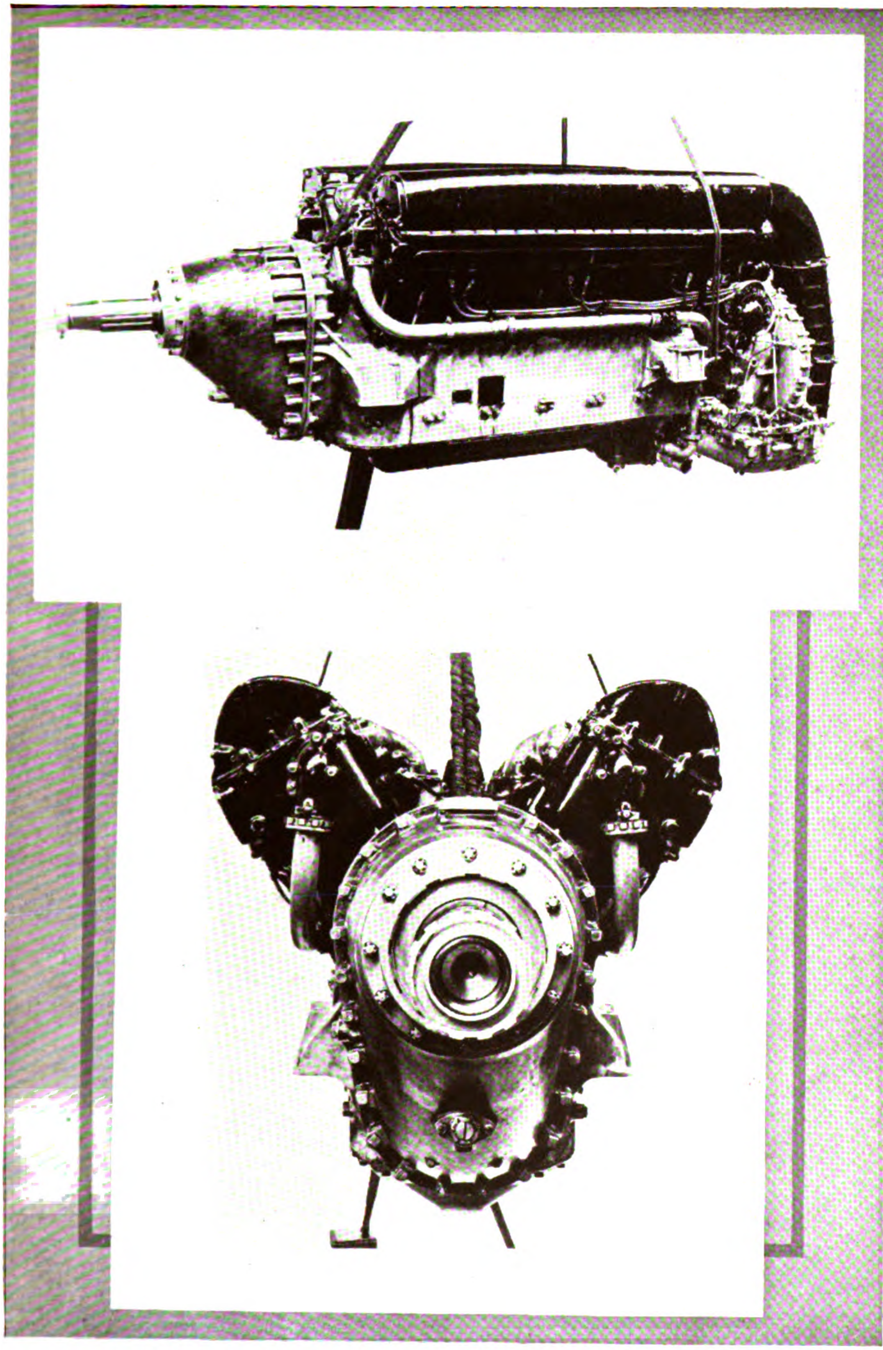
This taxi-ing business is a most unpopular game, however, because it is the gingerbread without any of the gilt on it. It forms the most difficult part of the piloting—everything is rough and uncomfortable —and just as the pilot is getting nice control and is ready to have a really good time, he has to shut off again. If he has not quite resisted the sore temptation to let the machine just leave the water, there is even so no time to judge his height and angle properly, and he can only pull the stick back as he shuts off and hope for the best, though I must confess the machines are very kind. If the machine has not left the water, the pilots gets very little sensation at all.

Flying Qualities of Aircraft.

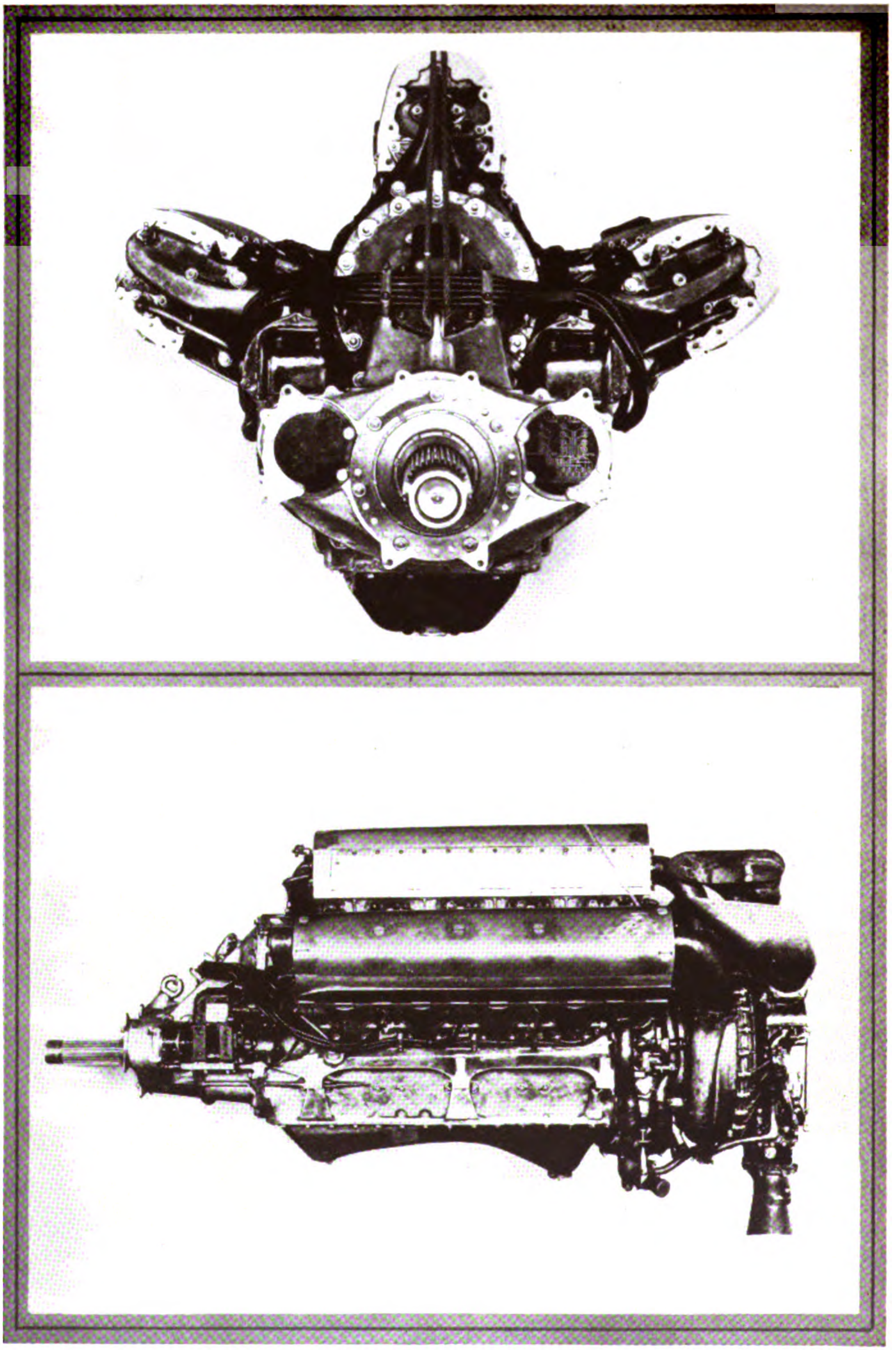
The pilot is now ready for his first solo, and this is a really delightful experience. In the air, the racers are beautiful machines to fly, being very steady, especially at high speed. They are very quick and light to handle, and are evenly balanced on all controls, but are in no sense fierce. In the Gloster IV.A and B there was at one time a slight unsteadiness on the rudder which made them yaw at high speed, but this was cured by putting all the rudder on top of the fuselage and abandoning the original shape, which was symmetrical above and below.

One really gets very little sensation of speed even when flying low, because it is impossible to see vertically downwards even if one wanted to, owing to the bulge of the fuselage. The only suggestion of speed that I have noticed is the way in which a headland or other well-marked piece of land seems to approach and widen out rapidly when one is flying towards it over open water. Even this idea of speed is noticeable only when one goes for the first time at a greater speed, as on the first trip or first solo on a 1929-type racer.

Now as to alighting. The machines move so quickly and gently through the air with the engine off that, to begin with, a pilot is very inclined to come in fast. (On my first trip I thought I was approaching quite slowly till I looked at my air-speed indicator and found I was doing 180 m.p.h.) However, one has to approach at a fair speed, otherwise the machine, owing to the small wing area, drops so rapidly and so far from the true angle of glide that it is hard to know when to flatten out. Having flattened out above the water, the machine floats along for rather a long way, and thus gives time to gauge the height above the water: then it is only necessary to hold off and keep



The Rolls-Royce " R " Type (Racing " H " Type) Engine, which develops over 1,500 h.p.



The Napier Lion VII D. Engine, which develops over 1,250 h.p.

bringing the stick back till she will no longer stay in the air, when she sinks into the water very nicely. Even if the pilot does not "hold off" till the last moment, and even if the heels of the floats touch too soon, the machine takes it very well, but probably does not touch again for a quarter of a mile or so.

High-speed Turning.

After the preliminary flights, we concentrated on turning. We got most valuable help in this from our technical officer, Mr. Clark, and his two assistants, Hardy and Wright, who were alternately attached from Farnborough.

We flew over a camera obscura to get the shape of a turn, and then low down over a strip of coast line which we measured off in hundreds of yards and reproduced on squared paper.

The pilot went into the turn as he crossed the coast, about-turned and came out of the turn as he recrossed, the diameter of the turns being marked from a boat. An accelerometer combined with an air-speed indicator was carried in the machine, and was switched on for each turn, and so we found the diameter (or radius since the turn proved roughly a semi-circle), the centrifugal force acting on the machine, the time taken to do the turn, and the speed during the turn.

From this our X chasers could work out the best turn. They had to find the mean between a very sharp turn which retards the machine considerably, and a very loose turn which involves covering a lot of extra distance.

However, we found the quickest turn was one in which the pilot just felt the acceleration fully, and I will digress a moment to explain what this is.

The medical people say that the centrifugal force acting down the body in a vertical turn draws the blood from an artery behind the eye. Anyway, the sensation is that the scenery becomes indistinct and then disappears. This "blacking out" as we call it causes no discomfort, and one's sight returns the moment one stops the turn. Some doctors say the blood is drawn from the whole brain and one gradually becomes unconscious, and loses sight last of all. But I believe this is not the case, since I have continued the turn and have remained "blacked out" until I have had enough of it, and have then been able to come out of the turn.

As to this turning business, we found a vertical turn with the stick pulled back, but not hard, was the most satisfactory. We decided, too, that it was best to get vertical as quickly as possible, but not to prevent the machine climbing a little on her fuselage if she wanted to, since any correction would mean extra control drag, and we could get some acceleration after the turn by losing height again.

Structural Strength.

Apart from these turns, the Air Ministry discouraged all stunting, because it was unnecessary and because there was always the possibility that some big strain might be put on the structure at high speeds. The machines, however, are extraordinarily strong. I believe the highest load put on the machine in a turn was seven times the normal load (by Stainforth, who, we say, has a cast-iron tummy), but the machines are stressed for far more than that.

Maintenance.

We were now nearly ready for the new aircraft, but before I refer to them it may be of interest to deal briefly with the maintenance of the old high-speed aircraft, because we had operated the new machines for such a short time that we had no real experience of them in this respect.

However, our training machines were the racers of the previous contest, and the new craft would probably receive much the same care.

These aircraft are built to do a minimum of test flights and then to run at full speed for less than one hour. They are not built to be ready for use at any moment or to last permanently, but rather to give maximum efficiency at a well-defined moment. Thus, for example, the oil radiators are of such thin gauge that they burst if cold oil is forced through them, and so they have to be filled with hot oil before the engine is started.

The water radiators, too, are of such thin gauge that they can be dented with hand pressure, and the slightest corrosion leads to leaks. They also form the wing covering, and because they are so light are not easy to change.

The whole design aims at reduction of frontal area to increase speed; engine installation, therefore, is most difficult and takes a long time. At first it took us a week to change an engine, though we reduced this time to two days by the end of our training.

As the engines are designed for maximum efficiency for a short time, the length of their life for training purposes is rather an unknown quantity.

We started with an engine-life of two hours, but this was gradually increased till finally we were allowed fifteen hours of engine-time, though we were lucky if we got half that time in the air, as the rest was utilized in engine tests and in warming the engine for flight, which had to be done slowly.

As a final example of maintenance difficulties, I may perhaps mention the sparking plugs. We found on the old high-compression engines that one set of twenty-four plugs would last about three flights of twenty minutes each. These carefully and beautifully made plugs

cost more than a sixpenny Woolworth's, and this example indicates the expense involved. Not that I would depreciate a Woolworth's—I believe it was tried, among others, on the bench in this year's Rolls-Royce.

The Gloster IV proved a most faithful friend to us. We all did our first solos on her, and we had less trouble in keeping her going than any of the others. In the end, we looked on her as a trusted veteran, as in a Service squadron one does on a machine that has done, say, 250 hours or more. She had done twenty-seven hours, and it was with much regret on our part that it was decided that she must be written off as time-expired!

Building of New Aircraft.

On August 8th, the first new racer, an S.6, arrived amid great excitement.

It may seem strange that we received it such a short time before the race, but the reason is easy to explain. The building starts with the specification of the engine, which is then built, tested, developed, retested, redeveloped and again retested, and so on. At the same time the machine is being built to take it, but during the process the engine shape, or power, or consumption, or cooling requirements may be altered, and the machine must follow the changes. All the time, attempts are being made to increase the power, for increased power spells increased speed. Eventually someone must call "Halt! Enough!"—but he is a brave man who does so, for in effect he says we must sink or swim with the power we have.

Initial Tests.

The first Gloster arrived a few days after the first S.6, but it was not so soon ready for flight, since it had had to travel by road dismantled and not quite finished, while the Supermarines had been able to come by water, erected, and almost ready to test.

We had known the S.5's would fly and we had known without preliminary taxi-ing practice when we first took them out, and we were rather impatient about taxi-ing trials.

However, we soon changed our tune when we tried the S.6. No one had experienced the high power and fairly low engine revolutions before, and we found she swung a lot and dipped one float badly owing to the propeller torque. Then we found she did not run on the step at quite the usual angle, and we felt doubtful of her take-off.

Still, these were only teething troubles, since by carrying most of the petrol in the right float we got over the torque trouble, and by trying the behaviour of the floats a little more we found she took off beautifully, and after minor engine adjustments behaved very well in the air.

With the Gloster VI we were not so lucky. The fine weather broke just as she was ready, and we had a most unfortunate delay. When the weather cleared, however, she passed what taxi-ing tests were necessary beautifully, and then most unluckily cut out with petrol trouble as soon as she got in the air on her first trip.

That trouble took some time to overcome, and, though she subsequently proved herself a splendid aircraft, both on the water and in the air, some obstinate form of petrol trouble continued to cut the engine out on turns. Eventually the racing engine had to be fitted owing to the approach of the day for the race, and it was hoped that the trouble might be rectified by making the modifications simultaneously.

The Position Before the Race.

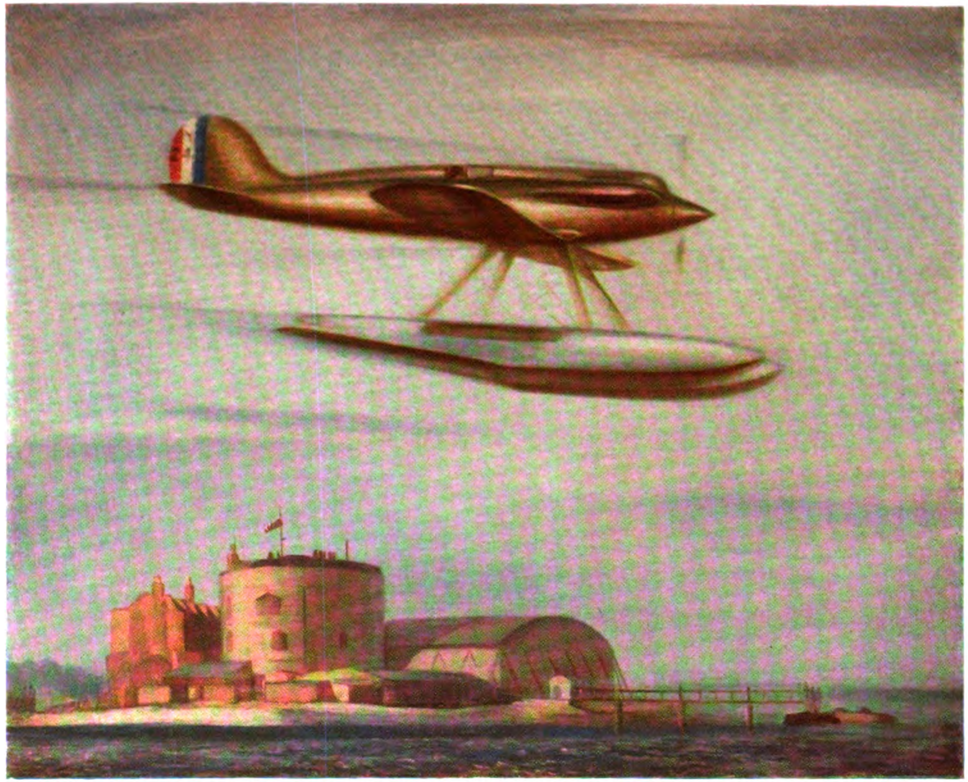
In spite of absolutely heroic work by day and night on the part of the mechanics of the Gloster and Napier firms, the engine would not run properly, and it was our one bitter disappointment in the whole contest that neither of the Gloster VI's could be entered.

Meanwhile, the first S.6 had a racing engine fitted, and we casually decided that she had better do a full-load test. I say casually, because she had flown with the greater part of her fuel, and we were confident she would be no trouble. Yet when she did go for it we got a nasty shock. Waghorn tried again and again, but she would not come off the water; however, in the end he succeeded.

The trouble was that she was right on the peak of her power in the initial stages of the take-off. By this I mean that the efficiency of the propeller which was designed to give full efficiency at over 300 m.p.h. was so low and the drag of the floats so high that they virtually balanced each other at about 25 m.p.h., and it was only with great difficulty the machine would accelerate beyond that point with the full load of petrol on board.

The nose of the machine seemed to come up very high and the tails of the floats dug so deep into the water that they set up a very high resistance. An attempt was made to cure the trouble by fitting extra buoyancy and planing surfaces on the after end of the floats in the form of blisters: these proved, however, on test that they upset the stability of the floats, and, though they did hold the tail up a little, they set up such a violent porpoise action that no movement of the controls could stop it, and the machine still could not accelerate.

We had, therefore, to fit a lighter propeller to get more power for the take-off. It would have given us more power in the air, too, but that would also mean still more fuel, so that we had to use the extra power for take-off only and then save the fuel by throttling slightly to make it last the course of the race. We had already had more power



From the painting by Geoffrey Watson

THE "GLOSTER VI"

Napier Engine

and therefore more heat to dissipate than the original radiators had been designed for, and extra radiators had been fitted on the floats, but these could not provide the additional cooling even if the fuel had let us use the extra power.

In the race, therefore, the S.6 pilots had to throttle down to a predetermined engine speed to save petrol and to a predetermined water temperature, too. Actually, on the day these two coincided—a pure bit of luck, since if the weather had been hotter the water temperature would have been too high for the maximum engine speed allowed.

Choice of Pilots for the Race.

We had kept a most careful roster of all flights in each of the practice machines, and we had hoped that everyone would be able to have a shot at each of the new machines before the race. We could then decide who should fly which, but by the end of July, before any of the new racers had come, we saw that there would be no time for that and so we held a small conference.

There was nothing to choose between the pilots, and, before we had received the machines from the works and could get any real choice between them, we settled that two should go for one type and two for the other. Waghorn and Atcherley rather wanted the Supermarines; Stainforth was definitely keen on the Gloster, and Greig was neutral. We therefore decided that Stainforth and Greig should have the Glosters and the other two the S.6's, and that if the S.5 flew Greig should have it, as he had been the first of us to meet it.

Pontoons.

Before I deal with the contest itself, I must say a few words about the pontoons which proved so useful to us. They are a kind of barge with an open stern, and a deck sloping downwards towards the stern, on which is fitted a sliding platform, heavily weighted. When the platform is lowered, the pontoon tilts still farther towards the stern. The aircraft is then grounded on the platform and wound up on it on to the pontoon.

There were engine starters and oil heating apparatus installed on board, and the aircraft could therefore be towed to the take-off point, clear of the water, and be prepared for launching whenever necessary. These pontoons thus saved us an enormous amount of trouble.

Navigability Trials.

We breathed a huge sigh of relief when Friday, September 6th, proved a good day. For ages we had awful fears of a postponement of the navigability trials, owing to bad weather. If this had been followed by a fine day on the 7th, the day fixed for the race, all that

the huge crowds would have seen would have been a series of landings and take-offs, probably miles away from them, followed by the sight of six seaplanes sitting at their moorings for six hours each, to prove that they would float.

However, Friday was fine and all went according to plan. All the pilots handled their machines splendidly and, of course, they were not carrying full load or running fast in the air, and so had to cope with no great difficulties. Nevertheless, Waghorn, after losing all speed for his first taxi-ing test and so getting his floats right down in the water after the landing, kept her on the step beautifully for the next taxi-ing run at " over 12 knots," and thus avoided the awkward acceleration from low speed. Atcherley did the same thing for both his taxi-ing runs. Greig, too, handled the old S.5 beautifully. She had been tuned up and fitted with a strengthened engine, but otherwise was exactly similar in power to the one in which Webster had won in Venice. Of course, Greig knew her well, but this was her first flight after her return to us from the works.

The water-tightness tests also passed off satisfactorily, and we only had one last trouble before the race.

Waghorn had had to run his engine slowly for some time before taking off for the navigability trials, and when he opened up to take off the engine had spluttered rather badly.

We thought nothing of it, but late on Friday night a spot of molten metal was found on a plug when they were being changed for next day. This proved on inspection to be from a score on the cylinder wall, and a whole cylinder block had to be changed. There was only a maintenance crew of Rolls mechanics at Calshot, and they were pretty well dead-beat; and so the police had to be called in to find and rouse a party of mechanics in Southampton down from the Rolls works just to watch the race. They were rushed up, and by a very fine effort managed this very big job with about an hour to spare.

The Race.

We were lucky again in having a glorious day for the race, and I need say little else generally about it since it has been described so often, except to emphasize the indication which it gave of the very fine supremacy of British design and workmanship in the building of aircraft and aero engines.

For the take-off we had to choose in accordance with the wind an area which could be kept clear of craft, and which was flexible enough to allow for a change of the wind while the race was in progress. It was a difficult business to keep this area and the lanes on the course free of shipping, but the Navy and our own boats did it wonderfully. We did not have a moment's anxiety on that score.

One needs a very big area for comfort since, when the nose is cocked up to take off or land, the view ahead is very poor. It needed careful work to get the machines away properly to time, the filling with oil, the engine-starting, etc., and also to pull the pontoons into the right position for launching. They, of course, lay head to tide at anchor, and we had to tow them round so that the seaplanes were launched pointing to the right of the wind. As we had not overcome the swing entirely, we launched them in this direction so that when the pilot opened out he would swing left directly into the wind.

All of them went off very well. The take-off was still perhaps the most nerve-racking moment, and for each one we all cheered and yelled " He's off! " as the floats left the water.

We pushed Waghorn and Greig off at the earliest possible moment, as we hoped by adopting this order to get the first of the two new Italian machines off, and to know something of their speed before Atcherley left. This worked well, especially as there was a big time interval between each machine for the sake of safety. Anyway, we did not have to alter Atcherley's instructions, since by the time he left all was going splendidly from our point of view. Waghorn had finished and had lapped very consistently after he had lost a tiny bit of speed in the first lap in getting used to the turning points with all the shipping about them. He was by this time sitting on the water swearing like a trooper, under the impression that he had run out of petrol just short of the finishing line on what he thought was the seventh but what was actually the eighth lap.

Alongside him was the *Iron Duke* and the whole company cheering him like mad, but he was concentrated on working out whether, if he had gained more height, he could have glided past the finishing line.

Greig, too, was well on towards the finish, lapping like a clock and getting very black from the exhaust from the centre block of cylinders in the Lion which in the old engines came out on the left side: on the new engines it was on the right side, since on a left-hand circuit one must look out on the left side.

On the other hand, poor Canavari had been forced to retire on the first new Italian machine and had made a splendid landing under great difficulties.

Atcherley got away well, but most unluckily lost his goggles just before crossing the starting line.

The left side wind-screens all had deflectors on them to allow the pilot to get one eye just outside it to see past the cylinder blocks as nearly straight ahead as possible, which was the only direction we ever wanted to look, and Atcherley as usual had his eye there. His goggles got covered with spray and then oil just as he started, and so he pushed the goggles up to cross the line, meaning to clean them later, but he

put his head to the side again, touched the draught, and that was the last of those goggles! Like the others, he had a second pair round his neck, but had no time to get them in position. He therefore had to keep his head right inside, and his later laps were a fine effort under such difficulties. He missed the Bembridge turn on the first lap when he was bothered about the goggles, and again on the fourth, but each time on the bank he could see the stern of the destroyer carrying the turning pylon. He missed by very little, but of course large or small must disqualify.

The Records.

During the next few days after the race, the mechanics changed the engine of the S.6 and partially got over the troubles of the Gloster VI.

Owing to poor visibility, Tuesday was not a good day, but we had to be away on the following day, and Stainforth on the Gloster went for the record. Somehow they had managed to get the engine to run reasonably well, but it was extremely difficult to see the course, and he did very well to get the 337 m.p.h.

For the record, one is allowed to dive from about 1,200 feet to a point half a kilo outside the three-kilo course, and to do this properly one wants good visibility. The angle of the dive is limited by the maximum revolutions to which one is allowed to take the engine. All that one can do is try to get those revolutions as quickly as possible by diving fairly steeply to start with and then to avoid pulling out quickly at the bottom, since a quick pull-out reduces speed.

The vital thing, however, is to arrive at the half-kilo point exactly at the bottom of the dive, and with the full acceleration from the dive; for complete success in this, good visibility is essential, as it is also for the straight flight along the measured distance.

Well, the speed of the Gloster was unknown, but Stainforth was certain he could have exceeded 337 m.p.h. in better weather.

I went up in the S.6 soon after, and, though the visibility was a little better, it was still bad.

On the S.6 we had some data, and the 355 m.p.h. that I reached was definitely disappointing, because I had used full throttle, of course, with a dive as well, and had only done 23 m.p.h. more than had been done on a four-cornered lap with the engine throttled in the race. Quite naturally, the effect of the visibility on me was held entirely responsible for this, and both Stainforth and I were given permission to try again.

The permission for another attempt, however, could only extend over two days and for one attempt each, because everyone had been so hard at it for so long that it was time for a rest.

We both went up again on Thursday, and, as is well known,

SUPERMARINE ROLLS-ROYCE S.6.

Stainforth had more engine trouble, and I got only 2 m.p.h. more. As Waghorn's propeller was unserviceable, we had meant to change mine, which was a new one, for another and probably better one that was on its way from the makers. But the weather cleared before it came, and we had to make the attempt at once for fear of another break. There was certainly a rather bad vibration, which, when I put my head against the head-rest to steady myself in the middle of one run, shook me so badly that I could see nothing. It had not been nearly so noticeable when I held my head forward, which no doubt damped out the vibration in my neck.

Whether the propeller was inefficient at the higher speed, whether something else was wrong, or whether the machine really will go no faster it is hard to say, and I can express no opinion.

CONCLUSION.

Anyhow, that was the end of a very happy party, and we pilots were lucky to have been given such work which so many other Service pilots could have undertaken as well and would have delighted in as much as we did. All had pulled together simply splendidly, and the Air Ministry officials, the firms, the flight, the motor-boat people—everybody combined into one splendid team. Yet this might well have proved a very difficult problem, because no one had at all an easy time.

It was all a rush, and, as I have said, it was bound to be a rush. Every minute had to be used. Someone was working all through the night for every night for a month. Many mechanics and A.I.D. officials, too, kept going for three and four days and nights at a stretch with only an odd hour or so of sleep snatched occasionally. For this very reason, it was particularly bad luck on Glosters and Napiers that they could not race, as they had even more rush than anyone else.

Even the pilots had to be on the watch to snatch weather whenever there was anything to fly. The poor " weather king " had a very thin time from us, as we asked nearly every morning for a weather report at 4 or 5 a.m., so as to get all the medical people and their motor-boats and the towing-boats, etc., ready by dawn if necessary. That poor weather prophet was asked for a prophecy about twenty times every day, I should think, yet he always tried to be hopeful and really produced wonderful weather for the great day.

We only once got a real fit of the dumps, and that was when the rumour of an Italian withdrawal was strong. But when they sportingly came along we learnt what a good chap an Italian is. They were extraordinarily nice fellows and fine pilots, and I wish I had space to talk more about them.

There is one question I have often been asked, and that is, " What is the use of all this sort of thing ? "

The machines after all are of no use for anything else but racing—they are much too hard to maintain; their range (220 miles) is much too short; they need much too ideal weather conditions, and take too much landing space to be any good for any other purpose. To expand the question of landing space only—one of them once cut out as soon as she got 10 feet in the air and yet the point from which she started the take-off run was three miles from the point where she pulled up.

Still, a race like this is a very big incentive to rapid advance in design. A definitely fixed date does lend a spur to the process of bringing theory to construction and construction to test.

Knowledge is definitely acquired which can be applied to more useful types of engines and aircraft, and many points in the freak of to-day will be incorporated usefully in the hack of to-morrow. There is no need to labour these questions, however, and there is another direction in which such an event serves its purpose, and that is in developing air sense in the general public.

Indeed, we were very lucky, for, if September 7th had been a bright day with a 20-m.p.h. wind, everyone would have turned up to watch the contest. But in that sort of weather the machines would get so badly thrown about at high speed on the water that the take-off would have been dangerous if not impossible. So in those conditions everyone would have been very disappointed and quite justifiably impatient. The event, then, might well have done more harm than good to the cause of aviation.

* * *

The following extract from a private letter received by a correspondent from a friend in Canada, and kindly sent to the Editor, is proof of the very great interest shown throughout the Dominions in the contest and of their proud feelings in the British victory :—

" I sure was tickled all up and down the fuselage to get your letter. I had another great and unexpected surprise, in Toronto. Casually dropping into a show one afternoon, they showed most of the race in the Fox Movietone News in which Atcherley and Waghorn featured to a great extent, and it sure was like the dim dark ages to hear them both talk, and boy the ' crates ' they had—I use that word ' crate ' because I dislike it so intensely, so very Yank in origin, but it is a true opposite of the buses they flew—gee they are perfect. I'm afraid I'm waxing sentimental, but when one sees productions like that and the performances that are being put up back home, gee it makes a lad tickled to death he's a Britisher."—Ed.

A NIGHT ON THE TIGRIS IN A FOLDING CANOE

By B. Fitz-James Haythornthwaite.

Here glides the sad mahila softly by
The panting coolies plodding on before,
The dark masts swaying on the starlight sky,
And distant voices calling from the shore.

Here dips the golden lantern to the stream
To stab the dark with burning dagger bright,
Here phantom dhows go floating, like a dream,
Along the moonlit silences of night.

The rains had been on, and for over a fortnight we had chafed, house-bound by a sea of slippery mud. The only vehicle which could be counted with any certainty on reaching its destination was a tank, and even one of these had floundered and sunk on the way to Baghdad. Yet there were drivers who, somehow, negotiated the quagmires in their Ford cars, and that long before the roads were open.

It was no uncommon thing if you adventured out in an ambitious Ford along the camel tracks at each side of the road, to see some similar and equally adventurous vehicle lurching in and out of the deep mud craters on its precarious and most athletic journey.

It was by no means rare to be bounced right off your seat against the hood, by which many passengers had their heads bruised or cut, but, as you underwent the many and varied sensations of the trip, it was consoling to watch the gyrations of any other vehicle. It was a comfort to realize as you saw him flounce and skid, wallow and lurch, his front wheels almost at right angles to the direction in which the

back wheels were propelling him, that his fate was no worse than yours; that he, in fact, was just looking like what you were feeling. Quite frequently cars were abandoned, and with mud to your knees you slipped and plodded home.

However, the day came when we could endure our confinement no longer, and, as the roads were not open, it was with difficulty that we found ourselves a Ford taxi, whose driver undertook to convey us to Baghdad by some mysterious desert route of his own.

The first stage was comparatively simple and entirely novel. With the engine racing in bottom gear we remained suspended by our hands from the stays of the back hood, while underneath us and around us Lizzie flounced and floundered with incredible vehemence and gusto. What did it matter if the engine boiled? Or if the front wheels *were* locked right over, almost at right-angles to the path of our progression? What did it matter if we moved sideways or even backwards? The driver clung to his wheel and clenched his teeth, the engine roared in its wild efforts, and the only alteration in our gear was from low to reverse. What really mattered beyond all else was that we should continue to move.

The second stage was no less precarious and athletic. Beyond the camel tracks we bounced out on to the open desert and the Ford rejoiced like to giant to run a race. We sprang into top gear; the wind whistled in our ears. Perhaps the worst was over. How fresh and cool it was after the oily vapours and steamy whiffs.

The low line of the horizon to the north was fringed with date palms, swaying under black skudding clouds. In the clear air the domes and minarets of Baghdad stood out in the clear relief of an unearthly brightness, against the dark masses of cloud beyond. The sun almost broke through, allowing long shafts of irridescence to escape upon the distant plain.

Meanwhile the flat mud was hard below us, and smooth going. But to judge the consistency of such mud as was now before us, was impossible even to the most practised; at times the flat desert would appear impassably ploughed up and soft. Yet we would race along it in top at thirty miles an hour. Or again, and especially at the bends, the surface would become treacherous, and a swerve be followed by a skid of sickening magnificence, and a rapid reversion to low gear and more cautious tactics.

It was thus, at all events, that we raced, wallowed, slid, bounced and floundered into Baghdad. Here we dismissed our taxi with gratitude, not unmingled with admiration, both for him and his vehicle. Then we betook ourselves to tea with Don and afterwards to a lecture (a great rarity in that city) on "The Folk Lore of Baghdad."

Before nightfall there was heavy rain, and, after a late tea followed

by the lecture, we emerged into the dark to find ourselves completely imprisoned in Baghdad. Wild as had been our chances of not sticking fast that afternoon, there was now no taxi-driver to be found who would undertake the return journey in the dark, after the fresh downpour.

We were, in fact, cut off from our beds and from our work, each one of us conscious that, early next morning, our absence would cause extreme unpleasantness. This realization came home to us eventually, as we stood beside the last of the taxi ranks, deep in the creamy mud and repeatedly splashed by passing vehicles.

There seemed nothing but trouble ahead of us till someone suggested that as we could not go home by land or air, we might yet do the trip (even if it was more than twice the distance) by water.

From the cosmopolitan shabbiness of New Street, there run at various angles narrow and unsavoury alleys. These are the real streets of the city. They are so narrow that a man with arms outstretched frequently can touch both walls. In summer they are cool and shady. But now it was down one of these that we must grope and slither, if we would reach the river. The mire of this gulley led at last on to the open banks of the river. Here the sudden space and uncontaminated air refreshed us. We seemed miles from the clamour and splash of New Street as we came out of the darkness into the mysterious, blue-white opalescence of moonlit fog above the flooded river.

Various launches there were, tied against each other, and to the bank; and all of them as silent, cold and unresponsive as the grave. When we had roused a few boatmen and seemingly innumerable dogs, it was only to find, after immense discussion, that the journey was out of the question. It was easy enough to go down, but, with the river in flood, to return was altogether another matter, and the minimum price entailed by the fuel necessary was altogether prohibitive.

It was then that I remembered my friend Don and his folding canoe. True there were three of us, but the canoe at a pinch could seat three. True it was now not far from midnight, but Don was never a man to be upset by trifles. We found him, I think in his bed, and explained our predicament. He blinked at us for a few moments in a silence which I mistook for hesitation, but which I can now only think was filled by calculation of how long the journey would take us. In a very short time we had carried the boat down to the river and had crammed ourselves in, while Don, who had lavished rugs and cushions upon us, stood by and steadied us for the start, and crowned his kindness by handfuls of apples and chocolate to sustain us during the night. We assured him that he would undoubtedly go to heaven on his merits, and being all set, we eased the little boat out into the troubled stream.

The night air was fresh and all our surroundings full of mystery and enchantment. Through the haze the moonlit waters shone all around us, and as the banks slipped past, houses would loom above us, and occasional lights throw their long swords across the water from the distant shore.

It seemed unnecessary to paddle in the perfect stillness through which the river was hurrying us, except where we had to avoid the mahilas stacked with timber tied up along the shore, huge ricks of wood floating above the water. In these the boatmen supped, or crooned around their open fires, regardless of their surroundings, each a different goblin, his sharp face to the red light, his shadow thrown up behind him like black wings.

Save for those sounds the river was exquisitely silent, you could not even hear the faint lisp of the water on the bank. Yet every now and then, gliding underneath a house, projecting from its foundation walls out over the water, we would catch, in passing, the casual voices of the inmates. We could see into the rooms from time to time, if they were lighted, as we made no sound in passing and could easily have climbed on to many balconies. Here was every opportunity for adventure and romance. Yet I am afraid we three sat stolidly upon our cushions, smoking, munching chocolate, and wholly given up to the mundane calculation of how long it would take us to do our fourteen miles home to bed.

In the bows sat Cackett, a solid Britisher if ever there was one, slow and sure of action, tenacious and prudent of purpose, whose boredom that afternoon, coupled with our blandishments, had beguiled him to join in our precarious journey into Baghdad. He had enjoyed the lecture well enough. But it was strange that he, of all people, should find himself encased in this flimsy rubber capsule of a boat, and embarked, at dead of night, upon an unknown river in the Tropics. He could not swim, he informed me sombrely, his deep voice breaking in upon a silence in which each of us had been busy with his thoughts.

Amidships, the lithe and graceful Crawford, for whom life was a pleasant thing in general, sat handling his paddle as though he had wished it were a teaspoon but had found it was a shovel, and peered through his glasses into the haze ahead with affable uncertainty.

For my own part, in the stern, I am ashamed to say that I had taken by far the most comfortable, if responsible seat. With my feet upon the tiller, I also peered ahead over the shoulders of my companions, and tried to remember how the banks of the river ran. Some months before I had done the trip by daylight, and I knew that there were long stretches of calm water before us where the current had been so slow as not to be endured save in extreme fatigue, but which I now felt would be fast enough to keep us awake and paddling.

Having passed the island at Alwiah, I turned well out into the middle of the river, so that we might not be driven, in the darkness, by the force of the current, down on to the left-hand shore. For at this point the Tigris, even at low water, in summer, flows quite swiftly, and now that the spring floods were rising, we were being borne down-stream, at a speed which we were wholly unable to realize. Once in mid-stream, we sat silently for a moment, and I suddenly heard the unmistakable sound of breaking water.

It held us all spell-bound and I strained my eyes through the moon-light to see if by any chance a river steamer was thrashing up the current to meet us. I could clearly see the few lights still burning in the village of Kaharrada coming rapidly towards us on the cold night air. And as there seemed to be nothing whatever to account for the sound, I realized that such was the force of this enormous and flooded river, at this point concentrated by a sudden turn, that, though the fall was not great, the deep water was thrashed into breakers on the surface, and tormented below by the seething currents. I had hardly realized this before we were in the breakers, the little boat bending under them, and Cackett protesting aloud that the spray was flying in his face.

I assured him that this disturbance was only momentary and that we had heaps of clearance from the shore, but I felt a catch of my breath when the tiller failed to grip the water, until I knew that this was simply the outcome of our own inertia.

"We must paddle," I said, "to keep command on our direction," and we all fell to work with a sudden alacrity which betrayed our feelings. Still the breakers continued, growing longer and easier, while Kaharrada and the shadowy outlines of the boats made fast to the shore swept past us and were left behind. Quite suddenly we were again in calm water, and spontaneously we all ceased to paddle.

"That was good fun," said Crawford, with a laugh. "Is there going to be much more like that?"

"No, I don't think so."

Nor was there; through all the rest of that long stretch of moonlit water we paddled or rested by turns, the only sounds that reached our ears being those of our own making. As night wore on we had a rest for food and polished off all that was left of Don's excellent supplies.

It was about 2 a.m., we were sitting in total silence, when, without the least warning, we were all startled out of our wits by a resounding splash close behind us. As we were right out in mid-stream, I could not possibly imagine to what it was due; while Cackett in the bows thought that I had flung myself overboard. "A fish," I exclaimed, as the thought struck me. And again we all sat silent, expecting the monster to leap again. "I've seen them so big that they hang down

to the ground on each side of a donkey. One single fish, arched across his back."

"Good Lord!" was Cackett's reverent comment, "I hope he doesn't land on us next time."

I have never seen a fish of any size leap out of the Tigris by day, and I wonder at the rareness of the chance that led this brute to do so just as we had passed over him. I am glad he did not happen to disport himself close in front of us. For, had he hurled his great body into the air to gleam a moment in the moonlight, and fall back again with so loud a splash right in our path, I can well imagine that we would have paddled to the shore like creatures possessed, and therefore have floundered home through the mire.

It was without further event that we reached our goal and scrambled out on to the muddy bank.

The whole camp slept before us in the moonlight. Not even a dog stirred under the silent stars. Unwinking electric lights glowed here and there. The enchantment of slumber had fallen upon all in that dwindling camp of British exiles. How long, I wondered, would it be before the camp would entirely close down, all men be withdrawn, and the hollyhocks and jackals alone remain in possession. How many that night had fallen asleep with thoughts of home, and even now were dreaming all the while of Plymouth Hoe. How the intense abstraction which we call sleep had reduced even the few who are unkind when awake, to a state of lovable tranquility. How many—all save us three, in fact—had gone to an uncomfortable bed after another day of house-bound monotony.

Yet, here we were, home again, three rather bewildered mortals, hungry for sleep, but profoundly happy. Happy to be within a few moments of our beds, happy at the sense of unprecedented achievement, happy that we had stolen unexpected and most unusual hours from the hand of Time.

*[This article appears here in place of the "Technical Notes" which were received too late to allow of their being passed for publication by the Air Ministry.—*ED.*]*

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The Short Gurnard II, Two-Seater Fleet Fighter-Reconnaissance. Rolls-Royce " F " Type Engine.

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The Hawker Harrier, Single-Engined Bomber. Bristol Jupiter VIII Engine.

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The Hawker Hornet, Single-Seater Fighter. Rolls-Royce F.S. Type Engine.

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The Hawker Hart 2-Seater Day Bomber. Rolls-Royce F.XI Engine.

THE ROYAL AERONAUTICAL SOCIETY AND THE ROYAL AIR FORCE

BY COLONEL THE MASTER OF SEMPILL, A.F.C., A.F.R.Ae.S.
(President of the Royal Aeronautical Society).

I HAVE been asked to explain briefly what are the functions of the Royal Aeronautical Society from the point of view of members of the Royal Air Force who may wish to join. One of the most frequent questions put to me by officers and others in the Royal Air Force is, "Am I eligible to join?" The answer is a most emphatic "Yes." Everyone is eligible to join the Society, which, incidentally, is the oldest aeronautical body in the world, either as a non-technical member or as a technical member. The Society has always catered for those who are interested in the progress of the science of aeronautics but have not, for the moment at least, the necessary qualifications to be elected to one of the technical grades, and in this class there are no restrictions whatever. Members of it obtain many of the privileges the Society offers, but membership in the grade does not confer any technical status.

The technical grades are Fellowship, Membership, Associate Fellowship, Associate Membership and Associateship, and among the qualifications for joining any of them are some directed specially to members of the Royal Air Force.

The lowest technical grade in the Society is that of Associate, and here one of the qualifications which admits an applicant to the Society is of special interest to the Royal Air Force. The particular rule to which I refer reads: "He shall have held commissioned or warrant rank in an appropriate branch of the R.A.F. for not less than three years." *Alternative* qualifications for Associateship are the holding of a ground engineer's certificate in at least two categories, *or* holding a pilot's "B" licence *or* holding a navigator's certificate. Inspectors or examiners of materials are also eligible under the rules for Associateship.

Turning to the qualifications necessary for Associate Fellowship, the following are extracts from the rules: "The applicant shall be actually engaged at the time of his application in the design or in the construction of such works as are comprised within the profession of aeronautics, or in the application to aeronautics of special branches of science, mathematics or engineering, or serving as a pilot, engineer or

navigator of aircraft. Provided that any candidate who, at the time of his application is employed as a teacher of aeronautics in a college which has courses leading to a degree recognized by the Council as exempting from Sections A and B of the Associate Fellowship examination, may be regarded as 'in the design of aeronautical work.'"

Another rule says that the applicant must have passed the Associate Fellowship examination or an exempting examination recognized by the Council and shall have had at least two years' experience as a pilot, engineer or navigator of aircraft.

Under the above and cognate rules any education officer of two years' standing, who holds an engineering degree, the diploma in aeronautics at the Imperial College of Science and Technology, or who holds the Board of Education Higher National Certificate and the Higher National Diploma in Mechanical Engineering is exempt. There are many other degrees, and diplomas which exempt, and a list of them will be sent on application to the Secretary of the Society.

An important exemption from the examination which directly applies to the Service is holding an R.A.F. Educational Certificate, provided the appropriate groups have been taken. A*, E and E* officers are also exempted from the Society's examination.

Associate Membership is largely confined to those who are concerned with the actual design or construction of aircraft, aircraft engines, or other essential components or accessories of aircraft, and who have passed the Society's examination or equivalent.

The grades of Fellowship and Membership are the highest technical grades in the Society. Those elected to these grades must generally be qualified as Associate Fellows or Associate Members and be employed in positions of responsibility, and shall have acquired a considerable degree of eminence in the profession of aeronautics.

Before leaving the subject of membership of the Society and the general conditions for joining, and discussing the advantages of being a member, I should like to draw attention to one very important section of the Society's membership, the Studentship section. Students, quoting from the actual rules, "shall be persons not under eighteen years of age and not more than twenty-six years of age" and who have the "object or intention of becoming engaged in aeronautics." There are a very large number of aircraft apprentices in the Royal Air Force who are students of the Society, and who are now preparing to become Associates, Associate Fellows or Associate Members by taking the appropriate examination. Students, as with all other members of the Society, receive the Society's Journal free, and have all the privileges of the Society, with the exception of voting.

I am often asked, "What object is there for me to join? What do I get out of it?"

I will do my best to answer those very natural questions.

First of all, anyone who is keen to get on in the profession he has adopted, who wishes to rise beyond the mechanic stage, endeavours to belong to the professional body which will look after his interests and will help him to obtain that advancement. This is true of all branches of engineering, civil engineering, mechanical engineering, electrical engineering and the like, and membership of the Institution of Civil Engineers, of the Mechanical Engineers or of the Electrical Engineers, confers a definite and valuable professional status which is recognized by manufacturers and leaders of industry. No less is true of technical membership of the Royal Aeronautical Society. The leading firms in the industry are now acknowledging that technical membership of the Society is a valuable qualification, and other things being equal employers in the industry are more likely to choose an Associate Fellow or an Associate Member, say, than one who is not. Thus membership definitely helps when looking for a post in civil aviation.

The Society publishes monthly a Journal which is sent free to all members. The Journal contains full reports of the papers read before the Society and of many of those read before the Branches. It also contains important original articles on various aspects of aeronautics, and abstracts from time to time from the technical press of the world, enabling members to keep in close touch with developments in all countries. At the Headquarters of the Society there is an index of technical information which may be consulted by any member, and the largest collection of aeronautical books in the world. There is also a large collection of slides and photographs which may be borrowed.

During the year the Society holds functions of various kinds, which are arranged so that members may meet one another more freely than they are able to do in the more formal atmosphere of the lectures. The Society is in close touch with the other bodies controlling British aviation and also with the leading aeronautical bodies abroad, enabling them to give members introductions and other facilities when travelling.

A booklet has been printed which gives many more particulars about the Society than I am able to give in the course of this article, and it will be sent free by the Secretary to anyone who applies.

SOME NOTES ON THE CONSTRUCTION OF METAL MILITARY AIRCRAFT

By F. Sigrist, M.B.E., F.R.Ae.S.

There are many factors which have an important bearing on the design and constructional features of military aeroplanes, and, although it is impossible to discuss each problem in detail in an article of this description, we can deal briefly with the major aspects. It must be remembered that, military considerations apart, there are fundamental characteristics in aeroplanes which exercise a great influence on their construction—characteristics which, whilst to some extent limiting the choice of materials, afford on the other hand scope for the designer as regards simplicity and detail refinement. The advent of the metal aeroplane has to some extent altered the outlook of military aviation inasmuch as machines of this type not only possess a longer service life, but show certain economies from the point of view of maintenance and reconditioning charges, thus allowing an increase in numbers without a corresponding increase in aggregate expenditure, and with progress in design and constructional methods, this tendency will become more noticeable.

The design of any military aeroplane is a compromise. In other words, it is impossible to design a machine which will fulfil the ideal in every respect. Therefore, the designer endeavours to attain perfection in the more important features and satisfy specification requirements without detracting too much from the detail layout. Performance is, of course, the primary consideration, and unfortunately performance is too often taken to mean pure speed rather than the combination of speed range, climb and flying qualities. It is not difficult to produce a fast aeroplane regardless of other considerations—the successful machine is the one which possesses all the performance characteristics suitable for its class as well as speed, and is easy to maintain and inspect under service conditions. The general aerodynamic layout is more or less settled by the purpose for which the machine is intended, but the selection and disposition of materials and the methods of construction vary considerably.

There are two materials which lend themselves admirably to metal aeroplanes, viz., steel and duralumin, either in the form of sheet, strip or tubing. Certain constructors (more particularly abroad) favour the all-duralumin construction; others favour the all-steel. It is probable that the greatest efficiency is obtained from the use of both materials in combination in such a manner as to enhance the advantages and mitigate the drawbacks of each. A hard and fast rule,

however, cannot be laid down, as each individual design must be adjudged from the point of view of the purpose for which the machine is required, and the construction, as we shall see, may therefore be "mixed" in varying degrees accordingly. Before considering design and manufacturing methods, it will be advisable to endeavour to obtain some appreciation of the merits and otherwise of these materials. In an aeroplane the main structure must be of material which possesses a high degree of elastic resistance to deformation and a high proof stress for weight.* These conditions are best met by alloys of steel, and alloys of aluminium, *i.e.*, duralumin. Recently magnesium alloys have been used, but with varying success, and for all practical intents and purposes the former metals are the only ones concerned. The weight ratio is approximately 3—1 in favour of duralumin, but the steel is stronger, even allowing for the difference in the relative densities. Duralumin is certainly more costly than the lower-grade steels, but in comparison with the higher-grade alloy strip and stainless steels the difference is not so marked. From the aspect of manipulation during manufacture, steel shows to advantage, as duralumin requires special heat treatment between processes, but the degree of ease with which each can be worked is comparable. Although each can be protected by electrolytic coating, enamelling or varnishing, steel has, generally speaking, proved more satisfactory from the point of view of reliability, inasmuch as duralumin has in some cases been found to be liable to intercrystalline corrosion which occurs without visible evidence on the surface of the metal.

In view, therefore, of the apparent superiority of steel, it may occasion some comment that duralumin is used constructionally as extensively as it is, and the reason may be summed up as—rigidity. It will be obvious that if full advantage is to be taken of the higher strength of steel it must be used in thin gauges, (in some cases as thin as .007 inches), otherwise the weight would be too great. It is equally obvious that, although the material possesses a high tensile or "pulling" strength, it is extremely difficult to give it any substantial resistance to a compressive stress. This difficulty is overcome to some extent by manipulation, *i.e.*, if a hollow strut or member of thin steel tends to fail by buckling, the local instability is mitigated by what may be broadly described as corrugation. Whilst this process is satisfactory in a large number of instances, it is more difficult with smaller and what may be called secondary structure components, and it is in these cases that duralumin can be used to advantage, inasmuch as a thicker gauge can be used without the drawback of added weight and with the advantage of increased rigidity. With the large three-engined type of machine, it is possible that duralumin as a main-spar

* See "Air Annual of the British Empire," p. 298, for further details.

material may be more suitable than steel purely from this aspect, but the case is open to argument. Generally speaking, it is safe to regard duralumin as an alternative to steel where the question of manipulating thin sections offers difficulty from the manufacturing point of view, and where the question of rigidity is of importance. It is controversial to lay down a hard and fast dictum, but the general practice is to design the primary structure, *i.e.*, spars, longerons, struts, etc., of steel, and the secondary, such as ribs, fairings, deckings, etc., of duralumin.

For flying-boat hulls and floats duralumin is necessitated by rigidity requirements, but steel is not impracticable, although it means some sacrifice in weight. Metallic coverings have not been adopted for military aircraft to any extent in this country, and would involve a fair increase in weight. Fabric is quite satisfactory, and inspection may be carried out with equal if not greater ease.

Having considered the relative value and merits of the premier constructional materials, it is possible to discuss the various systems of construction and methods of manufacture employed in the actual aeroplane. The fuselage structure may consist of steel and/or duralumin tubing and sheet. If, as seldom occurs, the structure is of the monocoque type in which the covering takes a proportion of the stress, duralumin sheet and tubing or strip bent to angle sections must be used, in order to obtain the weight plus rigidity ratio. Generally, however, steel tubing gives the best result. In some cases, steel strip manipulated to various sections and riveted together has been employed for struts and longerons, but the results have not been entirely satisfactory. Tubing can be used in two forms, either as solid drawn or as strip drawn to size with a self-locking joint, but the former appears in the majority of machines. The actual method of construction may be by welding, pin-joint connections or flat fish-plate attachments. The first method, *i.e.*, welding, has, of course, been common practice both on the Continent and in the U.S.A. for some years, and lately has been viewed with increasing favour in this country. It is a matter for argument as to whether this is a passing phase or not. Welding has undoubtedly a strong school of adherents, and with reason, as the results over a number of years viewed broadly can show reliability and cheapness. On the other hand, it most certainly results in a heavier unit, as only the low-grade materials can be welded with safety, and there is always the risk of the "human element" to be considered, as it is extremely difficult to tell from a visual examination whether the weld is perfect. It offers no particular advantage as regards maintenance, especially under service conditions. The pin-jointed structure can be made in two ways—by using solid drawn steel tubing with machined end fittings riveted and soft soldered or brazed into position, or by using lock-joint tubing (drawn from strip) and light alloy die-

cast end fittings pinned into position. Both methods result in a rigid unit, but the latter shows a saving in weight, especially on a large machine where high tensile strip can be used for the tubing for the struts and longerons. The former procedure is open to criticism as being rather more expensive and incurring the risks of internal corrosion due to soft soldering. Neither method of construction calls for any other than standard shop practice during manufacture, and the assembly jigs are simple in operation. The third and latest method is to utilize steel and/or duralumin tubes with plain fish-plate attachments and tubular rivets. In this instance the longerons are of steel tubing and the struts of steel or duralumin, each flattened at the point of contact. The flat plates are bolted to the flattened section of each longeron by a single cup-headed bolt. To these plates the strut tubes are attached by tubular rivets, forming complete side frames of a Warren truss type. These side frames are assembled together by self-aligning ball-ended cross struts fitting into the cup-headed bolts and by cross bracing wires attached to wiring plates. This system probably gives more advantages than any other type. The flattening process, which is extremely simple, enables several tubes irrespective of diameter to be connected at one joint neatly and effectively; steel and duralumin can be interconnected and interchanged with equal facility without regard for section or diameter; inspection and maintenance problems are reduced to a minimum, and, with welding, brazing and soldering processes eliminated, there is not the slightest risk of corrosion troubles. From the manufacturing aspect, this system is very suitable, inasmuch as it lends itself to production by semi-skilled labour, using plain layout jigs only.

The arrangement of the interior fuselage fittings and the disposition of the equipment is a matter on which it is impossible to do more than generalize. Accessibility of equipment, free run of control wires, facilities for rapid and adequate inspection and easy maintenance are the most important points, but so much depends on the type of machine and amount of load that each differs. The wing structure is of equal if not greater importance than the fuselage structure. The spars demand careful consideration from the point of view of stress calculation, and the types now in use have been thoroughly proved in service. The steel types with one exception are made from strip material manipulated to various shapes. The exception is a spar made from solid drawn steel tube in the shape of a double corrugation. It is heavy when compared to the type made from strip, but can be used with advantage on training machines and the like, where weight is not of such great importance. Rib attachment with this spar is simple and it is slightly cheaper. The strip spars vary somewhat in design, but are all made from the same material rolled or drawn to section in a hardened and tempered state, or sectioned from softened

strip and hardened and tempered afterwards. It is a moot point as to which method is the best. Hardening and tempering after manipulation necessitates the installation of a fairly expensive heat-treatment plant, and it is interesting to record the methods used for treating in this manner. In one instance, the strip is drawn slowly through an electric furnace and is supported by a die at each end, the quenching die being water-cooled, and in the other instance the strip is held in tension to ensure straightness and an electric current is passed through it. The results as regards uniformity are excellent, and by forming soft material additional manipulation can be carried out, thereby allowing a thinner gauge to be used. It is questionable, however, whether this slight gain is worth the extra cost, as the shaping, in order to obtain the necessary rigidity, renders the problem of rib attachment more difficult, apart from other considerations. With the hardened and tempered material, cold working naturally raises the proof stress to some extent, but not seriously. As will be seen by the illustrations,* strip spars show slight differences in design, being made from seven pieces assembled and riveted down to three pieces assembled and riveted. The latter generally results in a simpler construction. inasmuch as only two rows of rivets are called for and rib attachment is easier owing to the flat sides of the booms. Ribs, although seemingly a simple component, are not easy of design in metal at the moment, and, while there are several types, the ideal has not been found. Strip steel, strip duralumin, aluminium sheet and duralumin tubing have all been utilized separately or in combination. The steel rib is made from channel sections riveted, but suffers from lack of rigidity. The strip duralumin rib is usually made from " U " or " T " channel section with riveted attachments, but is not an ideal manufacturing proposition, inasmuch as heat treatment is called for during the manipulation process. The pressed-aluminium rib is probably the most satisfactory, but in comparison with the other ribs is at a disadvantage as regards weight, especially on wings of thick section. The tubular duralumin rib is lighter than any, but is difficult to manufacture, inasmuch as the material is of very thin gauge and great care is necessary in riveting; furthermore, the thin walls of the tubing are difficult to protect internally against corrosion, and offer very little resistance once this has started. There is really no valid reason why a wooden rib should not be used with a steel spar. The wooden rib is cheaper to manufacture, easier to replace, and presents no difficulty in the way of attachment to the spar. In one of the latest training aircraft this method of construction is used, and appears to be giving every satisfaction. Interplane and centre-section struts can be made from solid drawn tubing or from sheet manipulated to

* See "The Air Annual," Vol. I., 1929, pp. 303 and 463.

section in halves and either riveted or formed with a lock-joint. The tubular ones are slightly heavier, but are more rigid and if anything easier of inspection, inasmuch as there is no joint to be considered.

Tail-plane construction is on similar lines to that utilized in the main planes, except that in a number of cases the spar is constructed of solid drawn steel tubing instead of manipulated strip. Undercarriage design and construction is on quite normal lines, as the oleo shock-absorbing device is universally used. The only differences which exist appear in methods and placing of attachments, and these are to some extent dictated by the type of machine. Latterly, experiments have been carried out with the object of utilizing light alloy as a constructional material for petrol tanks. These experiments have resulted in the standardization of welded aluminium and riveted duralumin tanks. In the case of the former, the shell is welded and the baffles are bolted into position, using a Hallite washer and a compound to make the joint, whilst the duralumin tanks are riveted throughout, in some cases with Hallite washers and compound, and in other cases with steel washers and compound. Whilst the results have in a number of cases been satisfactory, experience generally tends to show that there is still room for improvement. The success of the tank depends to a great extent upon its shape, size and the number of baffle plates. Where the shape is perfectly square or cylindrical and sharp curves and corners are obviated, and there is a sufficiency of baffle plates, the result should be quite satisfactory, but where these considerations cannot be observed, or where the machine is of a type subjected to violent manœuvres, this class of structure does not as a rule prove efficient. Tinned steel tanks, although weighing, bulk for bulk, roughly three times as much as the light alloy tanks, are more reliable in service, but are liable to corrosion during storage unless very carefully cleansed with boiling water beforehand.

Corrosion is, of course, one of the most important considerations in an aeroplane. There are various protective processes for steel, and anodizing for duralumin—all of which are satisfactory, and which in service have given good results over extended periods, but there is a general rule which must be observed wherever these processes are in use—avoid scratching or penetrating this surface, as where this occurs corrosion commences earlier and increases at a greater rate.

It is difficult to over-rate the value of stainless steel as a constructional material for aircraft, and the use of it is increasing daily. It is now available in the form of sheet, tube and strip, and has been used to a great extent in the construction of R101. There is no doubt that in the very immediate future stainless steel will be specified on all sea-going aircraft and will result in considerable improvements and economies.

It is necessary before passing judgment on the structure of any aeroplane to give due consideration to all the factors. As stated, the first consideration must be the purpose for which the machine is required, as this to some extent dictates certain main structures. Then, not necessarily in order of merit, must be considered the questions of:

(*a*) Maintenance.
(*b*) Inspection.
(*c*) Facilities for repairs and replacements.
(*d*) Ease of production.

These are most important features. Ease of maintenance and inspection are interdependent factors, and it is essential that the construction be such as to allow inspection on all points to be a matter of quick and simple routine, and not calling for any special qualifications on the part of the person inspecting. Maintenance, inasmuch as it relates to greasing, periodical changing of cables, tightening locking devices, nuts, etc., calls for accessibility and simplicity. The question of ease of repair and replacements is not always given the attention it warrants. It is imperative, especially under service conditions, that the structure be quickly and easily repairable, and replacements be made with a minimum of delay by a class of labour which need only be semi-skilled. For this reason, a straightforward design employing materials which are obtainable immediately and which do not require special heat treatment or other processes before use is the most satisfactory, and the types shown in Figs.* 13 and 14 represent one of the most ideal combinations to-day. The production position is one which concerns the manufacturer rather more than the user, but is a point which must be broadly considered by the R.A.F. Production may in a case of national emergency be a deciding factor, and for this reason it is necessary to regard simplicity as the keynote of any design. Production may be attained in two ways, *i.e.*, by utilizing elaborate and extensive jigs and tools or by designing in such a manner as to enable semi-skilled labour to manufacture without difficulty. In the present position of the aircraft industry, the progress in aerodynamics and the diversity of opinion on metal construction, the former method is impracticable, and therefore the latter must of necessity result in a more satisfactory machine from every point of view.

That metal aeroplanes have not reached finality is obvious, and that opinion as to the best methods of design, construction and material differs is equally obvious, as recent machines in the same class showed a difference in weight of from three hundred to five hundred pounds. With further research work in the field of materials, and examination of various forms of construction after extensive service use, there is no doubt that a definite line will ultimately predominate, but such line will be on the basis of simplicity and reliability.

* See "The Air Annual," Vol. I., 1929, p. 306.

WIND STRUCTURE

By A. H. R. Goldie, M.A., F.R.S.E.

The wind, especially near the surface of the earth, varies continually in speed and direction. An absolutely steady wind current is a phenomenon which seldom occurs in nature; the nearest approach to a steady wind is one in which the variations are regular and small compared with the mean speed. The record of a Dines pressure tube anemograph may be regarded as giving in pictorial form the structure of a wind. The picture at first sight appears to be no simple one, but study suggests that the ever-present variations in wind speed and direction are of two main classes, known technically as gustiness and squalliness. Under the first term are comprised the more momentary fluctuations, those with periods of from one or two up to perhaps ten seconds, which go to make the record of the anemograph not a line, but a " ribbon." These fluctuations appear to arise from turbulence induced in the air when it passes over land or sea surface, and from convectional eddies and all other effects that combine to mar what might otherwise be smooth stream-line motion. As a whole, therefore, gustiness may be regarded as something arising at the lower boundary of the atmosphere—that is, at the boundary between air and land or between air and sea.

The " ribbon " of the anemograph chart may and often does appear as one of regular width laid evenly on the chart, but at other times it appears with waves, kinks and other irregularities of width or position; compare, for example, in the anemogram reproduced in Fig. 7 the velocity trace between 2h. and 6h. with the parts between 17h. and 22h. or between 6h. and 10h. Squalliness, for want of a better term, will be used in this article to comprise the longer period variations of wind speed—that is, the fluctuations which require from some minutes up to perhaps two hours to develop and pass away again. Anticipating an explanation which will be more fully developed later, it may be said that, according to recent research, squalliness appears to arise in cases where there exist in the upper air, at greater or lesser heights, currents of appreciably different speeds, or directions; in effect, squalliness seems also to be a wave or turbulence effect arising at a boundary, the boundary in this case being that between two overlying air currents.

We shall first outline separately the main features of gustiness and squalliness respectively; and afterwards deal with the phenomena which

may result from the combination of gustiness with particular types of squalliness; and finally remark on some general applications of the ideas developed.

The range of gustiness of a wind of ordinarily steady character is, on the average, proportional to the wind speed. At places with a good open sea exposure the range of fluctuation is some 30 per cent. of the mean velocity, *i.e.*, a " steady " wind of 30 miles an hour is one

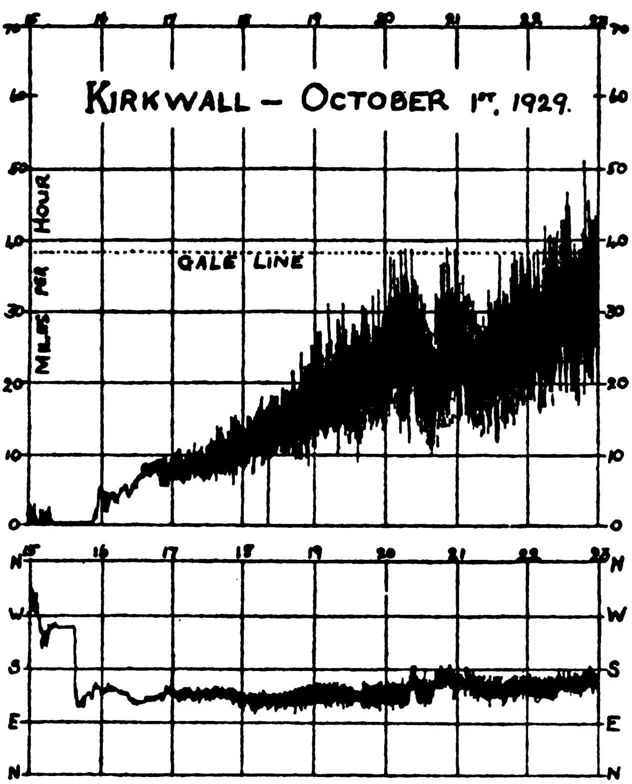

FIG 1.

in which we must expect continual variation between 25 and 35 miles an hour. At places inland and less openly exposed the gustiness factor, as it is called, may rise to 100 per cent., *i.e.*, a wind of mean velocity 30 miles an hour might fluctuate over a range of 30 miles an hour, or from 15 to 45 miles an hour. The remarks just made apply to wind speed. Equally important is the gustiness which exists in direction, and in vertical movement also. It has been found that in the case of land winds the eddy movements of the air, along the direction of the mean wind, perpendicular to it, and vertically, are all

three of the same order. This is explained on the hypothesis that the air near the ground is full of circular eddies, continually forming as the wind passes over obstacles and rapidly disintegrating again, and that these eddies have their axes distributed at random in all directions.

The case of winds blowing over a long stretch of sea appears to be quite different. The direction " ribbon " of the anemograph trace is then relatively narrow—sometimes, indeed, of almost negligible width.

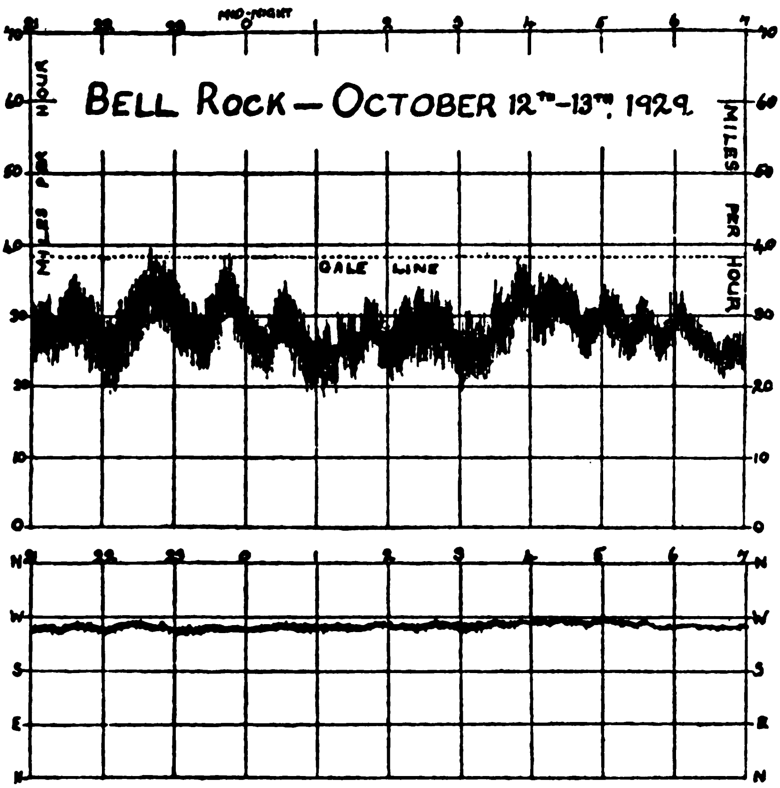

FIG. 2.

An anemograph established recently on the Bell Rock Lighthouse, twelve miles from the nearest land, indicates a gustiness in the transverse direction which is normally only one half of the gustiness in the direction of the mean wind speed, a very remarkable difference. See, for example, Fig. 2. Dynamical theory suggests that in such cases the gustiness in wind speed is the counterpart, in the air, of the waves in the sea.

When a record of the speed of a sea wind is taken on a time scale sufficiently expanded to show the individual gusts, it is found that

these gusts have a much greater degree of similarity and regularity than those in a land wind. The gusts are, indeed, not all entirely similar, any more than are sea waves, but tend rather, like sea waves, to come in trains or groups; the periodicities noted correspond also to those of sea waves. The distinction between a sea wind and a land wind in the matter of gustiness is rather like that between a musical note and a noise. In the former case, a well-defined type of vibration predominates; in the latter case, there is a confusion of vibrations. For this reason, sea winds lend themselves the better to mathematical investigation; and, in turn, from their records, one can deduce more easily something about their past history and associated upper air conditions. For simplicity, the specimen anemograms selected to illustrate this article have been chosen from the records of island rather than inland stations. At the same time, it has to be remarked that a strong wind which has traversed a long stretch of ocean may retain its characteristic type of gustiness in noticeable degree after crossing fifty or more miles of land.

Mathematical theory indicates that the range of the gusts over sea is proportional, amongst other things, to the difference between the mean wind speed and the speed of the propagation of the existing sea waves. Now, it takes some time for sea waves to develop or die down. We should, therefore, expect that a rapid rise in mean wind speed should at first be accompanied by an even more rapid rise in range of gusts and *vice versa*. The case in Fig. 1 is rather a good example, where a rise in mean wind speed from 5 m.p.h. at 16h. 30m. to 20 m.p.h. at 19h. 30m., is accompanied by a rise in the range of gustiness from about ½ m.p.h. to 10 m.p.h.—that is, by a change from 10 per cent. to 50 per cent. in the gustiness factor.

As a further example, there may be quoted a case where at Lerwick the wind, after blowing for many hours at a mean speed of 40 m.p.h., fell rapidly to 24 m.p.h.; in the same time, the range of gusts fell from 13 m.p.h. to 4 m.p.h., *i.e.*, the gustiness factor changed from one of 32 per cent. to one of only 17 per cent. Occasions, therefore, occur at sea where it is possible to forecast the way in which the gustiness of the wind is likely to change.

Squalliness is a meteorological feature of much larger dimensions than gustiness. Whenever one great air current blows over another, there is at least the chance that waves may be set up in the surface separating them, and there is ample evidence, though of an indirect nature, that such waves do frequently occur. In the first place, they give rise, at ground level, to small variations of atmospheric pressure, and these at times are of sufficient magnitude to show on the records of microbarographs and even occasionally on the records of ordinary barographs. Again, at or near the boundary between the two currents

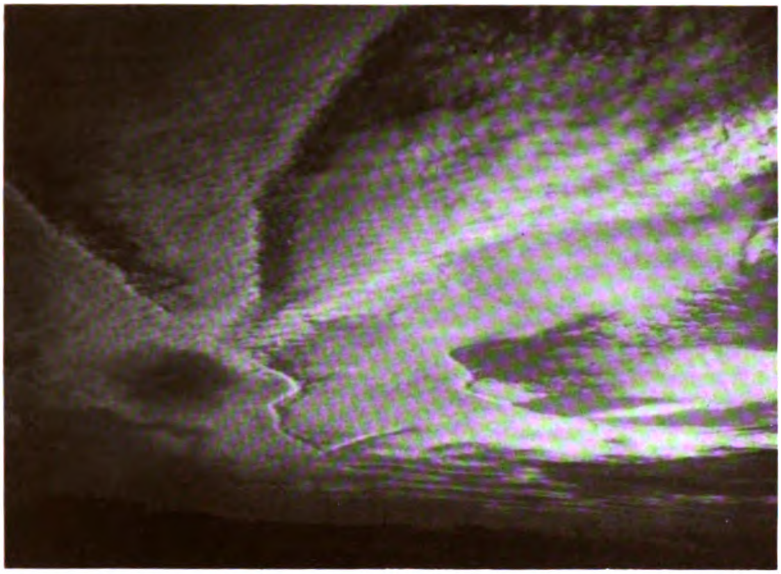

FIG. 3. CLOUD AT ABERDEEN ON 3RD APRIL, 1924, AT 17 HOURS 10 MINUTES.

FIG. 4. CLOUD AT ABERDEEN ON OCTOBER 28TH, 1924, AT 15 HOURS 30 MINUTES.

a particular mass of air may be subjected to variations of altitude and so of pressure, and so therefore (adiabatically) of temperature of considerable magnitude; and these in turn, by condensing moisture, lead to visible cloud arranged in waves or parallel bands. Compared with sea waves, the dimensions of these waves in the upper air are enormous. Calculation based on data of various sorts indicates lengths of 1 or 2 up to 10 miles from crest to crest as perhaps the most frequent, and amplitudes of oscillation at the bounding surface of from 300 to perhaps 2,000 feet; whilst the period of oscillation may range from two or three minutes in the case of the smallest waves to two or three hours in the case of the largest. By reason, therefore, of the very magnitude of these waves and of their relative slowness of movement, they escape the notice of the casual observer. Their importance in the matter of wind structure is, however, very great. By way of illustration of a simple type, attention may first be called to Fig. 2, which shows quite a regular wave in the velocity "ribbon" of a pressure tube anemogram. This smooth, regular type occurs where the lower air current is of considerable depth, possibly 5,000 feet or more. Figs. 3 and 4 (reproduced, by kind permission, from the Proc. Roy. Soc. Edin.) are photographs taken by Mr. G. A. Clarke, of Aberdeen, and show clouds associated with atmospheric waves of this sort. The cloud formation in the former, if looked at upside down, is exactly what one might see on a small scale on the surface of the sea viewed from a height of a few hundred feet. It was associated with waves of periods from 3 to 15 minutes. Fig. 4 shows bands of cloud associated with the crests of atmospheric waves of a period of 50 minutes. The Cumulo-Nimbus cloud is interesting evidence that the upward movement at the crest of one of these waves had proceeded too far for stability. The two cases shown above are simple, and their effects at ground level unexciting, the separating surface between the two air currents—that is, the surface which is affected primarily by the wave motion—being at a considerable height above ground. No more effect is felt at ground level than would be felt at the bottom of an ocean on whose surface there existed a rough sea. Some very remarkable effects may, however, be produced at ground level in cases where the separating surface, or surface of discontinuity, as it is called, is at a low elevation. For example, a night calm may have set in at ground level and stillness may reign through (say) the lowest 300 feet of air. Above a fairly sharp discontinuity at this height there may be a moderate wind. Sooner or later, some waves will be set up at this discontinuity, and we then get the otherwise-unusual phenomenon of a breeze virtually without gustiness; the breeze rises steadily and smoothly from calm to perhaps 5 to 10 m.p.h., and then steadily dies down to calm again in the course of 5 to 15 minutes. The phenomenon

may be repeated again and again for several hours. The reason for this smoothness is that in the night calm the lowest layer of air is virtually devoid of turbulence. Sometimes, however, the tips of these night pulses of wind may show a little gustiness.

More serious effects arise where strong upper winds set up really big waves in a shallow lower layer of air. This case is analogous to that of ocean waves breaking in shallow water. Fig. 5, for example, portrays a case where a strong, warm south-westerly wind was undercut at about 17h. by a relatively shallow layer of colder westerly wind.

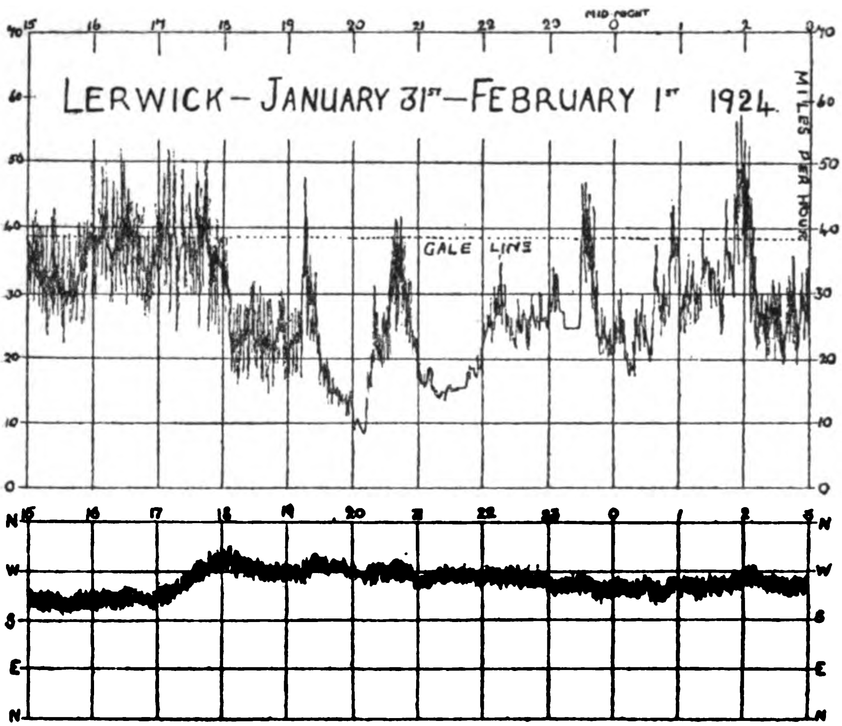

FIG. 5

The lower current was afterwards whacked up into several big waves of period about 1½ hours. It will be seen that the gustiness of the anemograph trace here is much greater at the crests of the wind waves than at the hollows, giving the trace the appearance of a series of U's. This is characteristic of the case where the atmospheric waves are being propagated in much the same direction as the lower wind current is flowing. Wherever the separating surface between the lower and the upper air currents is pressed down almost to ground level, a kind of breaking-wave effect is produced, coupled with a great accentuation of the gust eddies. The combined effect in extreme cases

may make possible the production of a momentary squall of 60 m.p.h. in a shallow ground current whose average speed, taken over an hour, may not have exceeded 10 m.p.h. Some notable squalls seem to have arisen in this way.

A much less common case is one where the upper wind causes the waves to run in a direction contrary or nearly contrary to that of the lower wind. The velocity trace then takes on an appearance suggestive of a series of inverted U's, as in Fig. 6, indicating the periodic occurrence of conspicuous lulls in a wind at other times moderate or

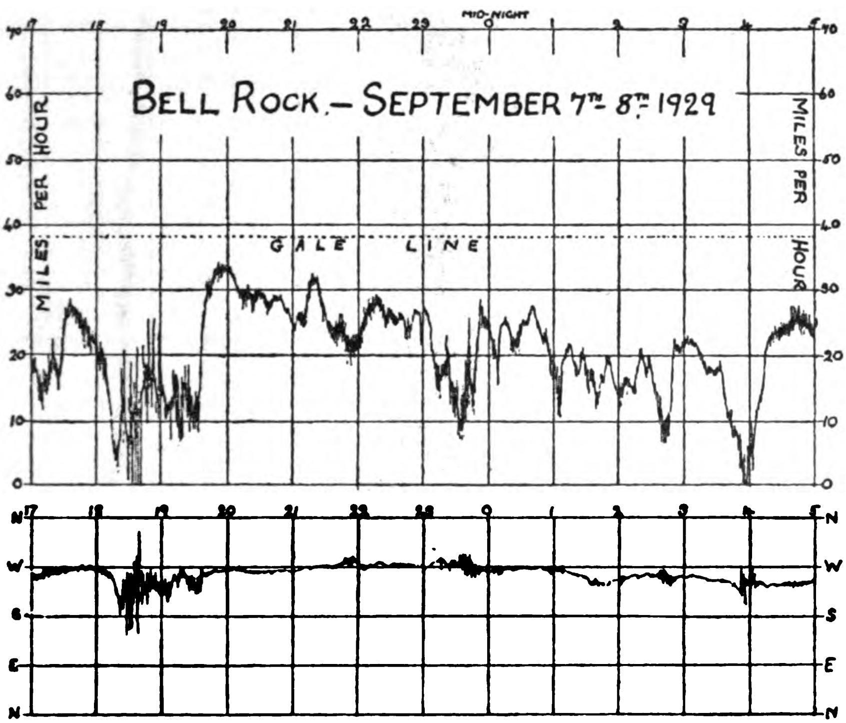

FIG 6.

strong. The gustiness in this case reaches its maximum whenever the wind falls to a minimum.

There is yet another type, namely, where the direction of propagation of the waves is more or less across the lower current. In this case, the *direction* record shows strongly the squalliness and the variation in range of gustiness. Fig. 6 serves to illustrate this type as well as the previous type.

Some general applications of the above ideas, and particularly of the connection between squalliness and upper air conditions, will doubtless occur to the reader. For example, when a depression is passing

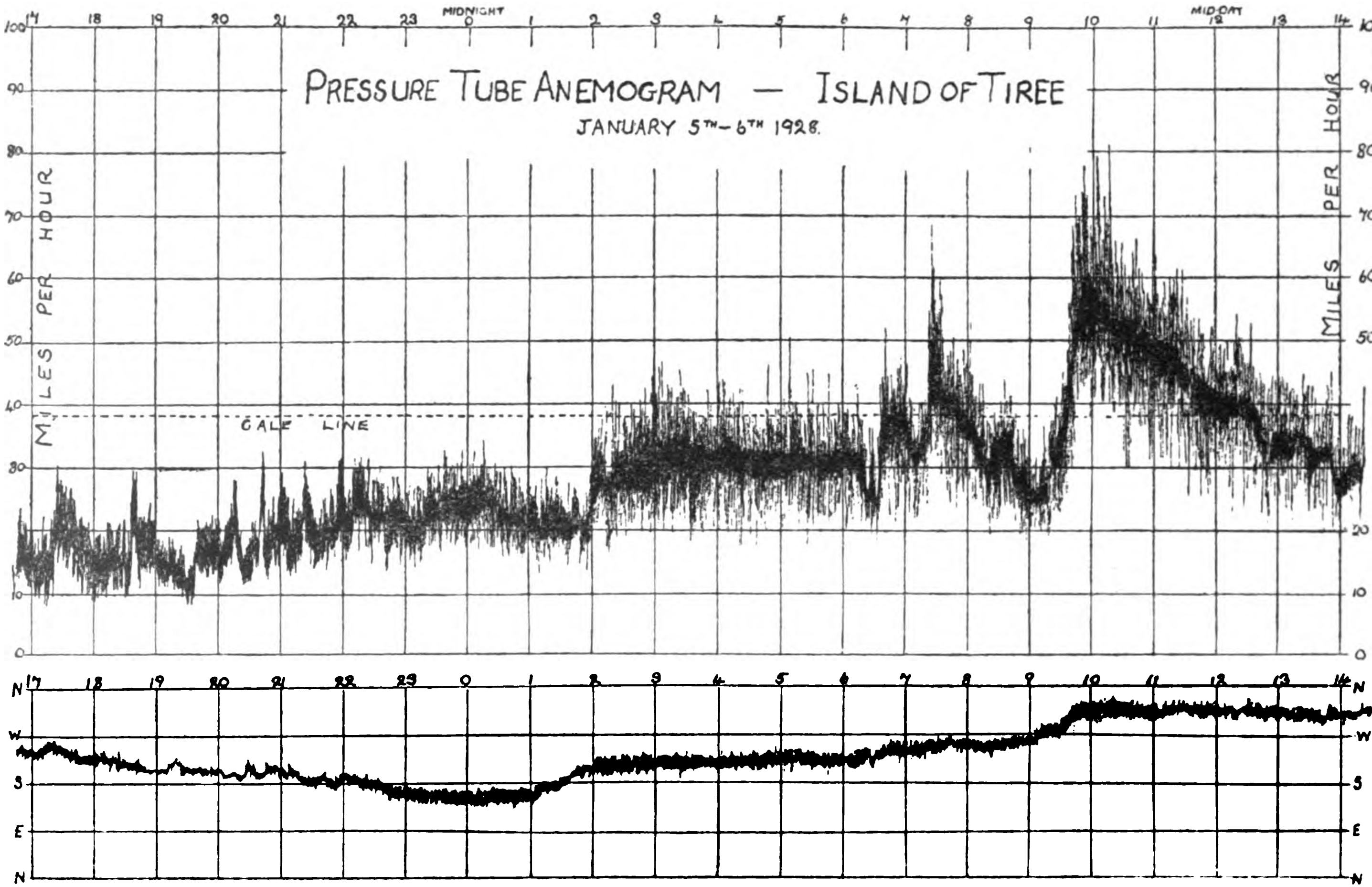
PRESSURE TUBE ANEMOGRAM — ISLAND OF TIREE
JANUARY 5TH – 6TH 1928.
MILES PER HOUR
GALE LINE
MIDNIGHT
MIDDAY

FIG 7.

to northward, we know that the sequence of events is represented broadly by three stages:—

First there is the sector of polar air, generally a wind backing to south-east, which has above it the equatorial air moving usually from south-westward. This stage is ended by the arrival of the "warm front," and we then have a sector in which the warm south-westerly wind (equatorial air) extends right down to ground level. This stage in turn is ended by the coming of the "cold front," after which we have a sector of cold north-westerly wind (polar air), above which, at least for a time, the warm south-westerly wind continues to blow. These three stages in the passage of a depression may therefore be expected to show up in the wind structure; and Fig. 7 shows that this is indeed the case. From the beginning up to 2h., and more markedly up to 22h., we have a wind of relatively small gustiness upon which is impressed moderate squalliness. This squalliness is of the type which gives cause for the popular impression that the raising of the dust frequently presages rain. At about 2h., the south-westerly wind comes right down to ground level and we have a spell of just over four hours of considerable but uniform range of gustiness and without squalliness. The coming of the edge of the wedge of north-westerly wind causes a change in turn to marked squalliness, at first of the type associated with a shallow lower layer, but giving place, as the north-westerly wind deepens, to a fairly uniform condition of gustiness. It will thus be seen that the features of the anemogram afford in some degree a key to the progress of the changes of weather, and *vice versa*.

Another application of these ideas may suggest itself. It is well known that there exists a certain degree of balance between wind speed and the horizontal gradient of barometric pressure. It may now be asked what happens when, by means of atmospheric waves as described above, the speed of an air current is raised above or lowered below the speed which would correspond to balance with the barometric gradient? In other words, what effect has the rotation of the earth on the whole motion? The answer is that, if the period of the waves is long enough, and if the variation in speed is great enough in proportion to the original mean speed, the air tends to wander to left or right according as its speed is below or above the original equilibrium speed. The result is a wobble in wind direction whose phase differs from the phase of the wave in wind speed by an amount which is calculable. Figs. 2 and 5 show this direction wobble in different degrees, and in each case to approximately the extent suggested by theoretical calculation. It is probably significant that these wind waves are seldom noted as reaching periods of more than two or three hours. Possibly when this stage is reached, the wobble in direction becomes so great that the waves are broken down. Alternatively it would seem possible

that in special cases the wave movements, as a result of the rotation of the earth, might be transformed into horizontal circulations with transverse components of such magnitude as to suggest that the next stage of the development must be towards a complete cyclonic circulation; further research may throw light on the matter.

Yet another and perhaps more practical application of these ideas is to determining the conditions of maximum safety, in the sense of security from any sudden change from existing wind conditions. These conditions are to be found in deep uniform currents, and in particular well within broad belts of " equatorial " air.

The cases of greatest danger, in the sense of liability to high squalls or sudden changes of mean wind velocity, are in the " polar " air, and are associated with the following circumstances:—

(1) A surface of discontinuity at a low elevation; this may lead to wind waves of large amplitude, with, in addition, distended gusts at their peaks; or

(2) A large discontinuity of temperature between the lower and upper air currents; this makes the period of oscillation short and the changes more sudden.

The greatest risk in the matter of changes of wind direction appears to arise when:—

(3) The direction of the relative motion between the two currents is considerably inclined to the lower current.

The writer is indebted to the Director of the Meteorological Office for permission to select illustrations from official records.

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ROYAL AIR FORCE

THE KING
Chief of the Royal Air Force.

AIR COUNCIL.

Secretary of State for Air (President of the Air Council) :
Brigadier-General The Right Hon. Lord Thomson, P.C., C.B.E., D.S.O., *p.s.c.*

Under-Secretary of State for Air (Vice-President of the Air Council) :
F. Montague, Esq., M.P.

Chief of the Air Staff :
Marshal of the Royal Air Force Sir Hugh M. Trenchard, Bart., G.C.B., D.S.O., D.C.L., LL.D.
to be succeeded on 1/1/30 by
Air Chief Marshal Sir John M. Salmond, K.C.B., C.M.G., C.V.O., D.S.O., A.D.C.

Air Member for Supply and Research :
Air Marshal Sir John F. A. Higgins, K.C.B., K.B.E., D.S.O., A.F.C.

Air Member for Personnel :
Air Vice-Marshal T. I. Webb-Bowen, C.B., C.M.G.

Secretary of the Air Ministry :
Sir Walter F. Nicholson, K.C.B.

R.A.F. COMMANDS (HOME).

Air Defence of Great Britain.

Headquarters : Hillingdon House, Uxbridge, Middlesex.
Air Officer Commanding : Air Marshal Sir Edward L. Ellington, K.C.B., C.M.G., C.B.E., *p.s.c.*

Wessex Bombing Area.

Headquarters : Andover, Hants.
Air Officer Commanding : Air Vice-Marshal Sir John M. Steel, K.B.E., C.B., C.M.G.

Fighting Area.

Headquarters : Hillingdon House, Uxbridge, Middlesex.
Air Officer Commanding : Air Commodore Hon. J. D. Boyle, C.B.E., D.S.O.

No 1 Air Defence Group.

Headquarters : 145, Sloane Street, Sloane Square, London, S.W.1.
Officer Commanding : Group Captain W. F. McNeece Foster, C.B.E., D.S.O., D.F.C.

Inland Area.

Headquarters : Bentley Priory, Stanmore, Middlesex.
Air Officer Commanding : Air Vice-Marshal A. E. Borton, C.B., C.M.G., D.S.O., A.F.C.

No. 21 Group (Stores and Depot).

Headquarters : West Drayton, Middlesex.
Officer Commanding : Group Captain A. B. Burdett, D.S.O.

No. 22 Group (Army Co-operation).

Headquarters : South Farnborough, Hants.
Air Officer Commanding : Air Commodore N. D. K. MacEwen, C.M.G., D.S.O.

No. 23 Group (Flying Training).

Headquarters : St. Vincents, Grantham, Lincs.
Air Officer Commanding :

COASTAL AREA (FLEET AIR ARM AND NAVAL CO-OPERATION).

Headquarters : 33-34, Tavistock Place, London, W.C.1.
Air Officer Commanding : Air Vice-Marshal C. L. Lambe, C.B., C.M.G., D.S.O.

No. 10 Group (Naval Co-operation).

Headquarters : Lee-on-Solent, Hants.
Officer Commanding : Group Captain A. W. Bigsworth, C.M.G., D.S.O., A.F.C.

ROYAL AIR FORCE COLLEGE, CRANWELL.

Headquarters : Cranwell, Lincs.
Commandant : Air Commodore A. M. Longmore, C.B., D.S.O., *q.s.*

ROYAL AIR FORCE, HALTON (SCHOOL OF AIRCRAFT APPRENTICES).

Headquarters : Halton Camp, Bucks.
Air Officer Commanding : Air Commodore I. M. Bonham-Carter, C.B., O.B.E.

ROYAL AIR FORCE STAFF COLLEGE.

Headquarters : Andover, Hants.
Commandant : Air Commodore E. R. Ludlow-Hewitt, C.B., C.M.G., D.S.O., M.C., *p.s.a.*

R.A.F. COMMANDS (OVERSEAS).

ROYAL AIR FORCE, MIDDLE EAST.

Headquarters : Villa Victoria, Cairo.
Air Officer Commanding : Air Vice-Marshal F. R. Scarlett, C.B., D.S.O., A.F.C.

Transjordan and Palestine.

Headquarters : Amman.
Air Officer Commanding : Air Vice-Marshal H. C. T. Dowding, C.B., C.M.G., *p.s.c.*

IRAQ COMMAND.

Headquarters : Hinaidi, Iraq.
Air Officer Commanding : Air Vice-Marshal Sir Robert Brooke-Popham, K.C.B., C.M.G., D.S.O., A.F.C., *p.s.c.*

ROYAL AIR FORCE, INDIA.

Headquarters : Imperial Secretariat, South Block, New Delhi.
Air Officer Commanding : Air Marshal Sir W. Geoffrey H. Salmond, K.C.B., K.C.M.G., D.S.O., *p.s.c.*

No. 1 (Indian) Group.

Headquarters : Peshawar, India.
Officer Commanding : Group Captain H. Le M. Brock, D.S.O., *p.s.a.*

No. 3 (Indian) Wing.

Headquarters : Quetta, India.
Officer Commanding : Wing Commander J. O. Archer, C.B.E.

ROYAL AIR FORCE, MEDITERRANEAN.

Headquarters : Valletta, Malta.
Air Officer Commanding : Air Commodore J. L. Forbes, O.B.E.

Aden Command.

Headquarters : Steamer Point, Aden.
Officer Commanding : Group Captain C. T. Maclean, D.S.O., M.C.

AIR ATTACHES TO EMBASSIES AND LEGATIONS.

Headquarters.	*Accredited to.*	*Name and Rank.*
Paris	France, Belgium, Holland.	Group Captain J. R. W. Smyth-Pigott, D.S.O.
Washington ...	U.S.A.	Wing Commander T. G. Hetherington, C.B.E.
Rome	Italy.	Group Captain C. R. S. Bradley, O.B.E.
Buenos Aires ...	Argentine, Brazil, Chile, Uruguay.	Wing Commander E. H. Johnston, O.B.E., D.F.C.
Berlin	Germany, Norway, Sweden, Denmark.	Group Captain M. G. Christie, C.M.G., D.S.O., M.C.

DOMINION LIAISON OFFICERS.

Australia.—Squadron Leader H. N. Wrigley, D.F.C., A.F.C., *p.s.a.*, Room 523, Australia House, Strand, London, W.C.2.

Canada.—Squadron Leader A. B. Shearer, Air Ministry, Adastral House, Kingsway, London, W.C.2.

New Zealand.—Major T. M. Wilkes, M.C., Air Ministry, Adastral House, Kingsway, London, W.C.2.

APPOINTMENTS.

Rank and Name.	*To.*	*Date.*	*Remarks.*
Air Chief-Marshal			
Sir John M. Salmond, K.C.B., C.M.G., C.V.O., D.S.O. ...	—	1/1/30	On appointment as Chief of the Air Staff.
Air Vice-Marshals			
F. R. Scarlett, C.B., D.S.O.	H.Q.,R.A.F., Middle East	25/10/29	On appointment as Air Officer Commanding.
T. I. Webb-Bowen, C.B., C.M.G. ...	Air Ministry	1/1/30	On appointment as Member of the Air Council (Air Member for Personnel).
H. C. T. Dowding, C.B., C.M.G. ...	H.Q., Trans-jordan and Palestine	7/9/29	On appointment as Air Officer Commanding (temporarily).
A. E. Borton, C.B., C.M.G., D.S.O., A.F.C.	H.Q., Inland Area	2/11/29	On appointment as Air Officer Commanding
Air Commodores			
A. M. Longmore, C.B., D.S.O. ...	R.A.F. Depot	15/10/29	Supernumerary, pending taking over as Air Officer Commanding, Cranwell.

W. R. Freeman, D.S.O., M.C. ...	H.Q. Inland Area	15/10/29	On appointment as Chief Staff Officer.
W. G. S. Mitchell, C.B.E., D.S.O., M.C., A.F.C. ...	Air Ministry, Dept. of A.M.P. (D. of T.)	4/10/29	On appointment as Director of Training.

RETIREMENTS.

Rank and Name.	*Date.*
Marshal of the Royal Air Force Sir Hugh M. Trenchard, Bart., G.C.B., D.S.O., D.C.L., LL.D.	1/1/30
Air Vice-Marshal Sir Oliver Swann, K.C.B., C.B.E.	2/11/29
Air Vice-Marshal C. A. H. Longcroft, C.B., C.M.G., D.S.O., A.F.C.	2/11/29
Air Commodore C. R. Samson, C.M.G., D.S.O., A.F.C.	6/11/29
Air Commodore T. C. R. Higgins, C.B., C.M.G.	1/11/29
Air Commodore E. L. Gerrard, C.M.G., D.S.O.	15/11/29
Air Commodore B. C. H. Drew, C.M.G., C.B.E.	15/11/29

PERSONNEL.

Flying Training.

During the period July 1st to September 30th, 1929, the following completed courses of instruction at Flying Training Units :—

	Officers.	*Airmen.*
Ab initio Courses	51	29
Flying Instructors' Courses ...	19	8
Conversion Courses	12	1
Refresher Courses	5	1

Thirty officers of the Reserve of Air Force Officers and four Auxiliary Air Force officers duly qualified and were awarded the Pilot's Flying Badge.

R.A.F. College, Cranwell.

During the period under review thirty-one Royal Air Force cadets completed their training at the R.A.F. College and have been granted commissions. Four foreign cadets also completed the same training.

Overseas Commands

ADEN.

During September trouble was experienced with the Koteibi tribe, who inhabit an area north of Assauda on the main route from Dala to Aden. The tribesmen had for some time past been guilty of interfering with traffic and looting caravans on the road. As a warning, the stipends paid to the Koteibi sheikhs were stopped, but as this proved to be of no avail, they were warned that if the offences did not cease air action would be taken against them. They accordingly promised to bring the tribesmen to reason. At

the Sheikh's request aircraft of No. 8 (Bombing) Squadron assisted by carrying out demonstration flights over the area and dropping warnings on the tribesmen. Up to the present no further trouble has occurred.

IRAQ.

During the period under review the situation generally has remained quiet, and no offensive operations have been necessary.

Reduction of Forces.

A further reduction of forces was effected on October 1st, when No. 6 Army Co-operation) Squadron was withdrawn from Iraq. The advance party, which left Hinaidi on October 2nd in five Victoria aircraft of No. 70 Squadron, arrived at Moascar the following day, after spending the night at Amman. A mechanical transport convoy conveying the remainder of the personnel and stores left for Moascar on October 6th. The squadron aircraft will be flown to their new station as soon as the necessary arrangements have been completed. The squadron, which is being transferred to the Middle East Command, has been replaced at Mosul by No. 30 (Bombing) Squadron from Hinaidi.

No. 203 Flying Boat Squadron.

A flight from Basrah to Mosul and return was carried out during July by one flying boat of No. 203 Squadron. The flying boat left Basrah on July 9th, and, after stopping at Hinaidi, made a successful landing on the Tigris at Mosul on the following day. Various landing and taking-off tests were carried out, from which it was ascertained that the river at Mosul could be used for the operation of flying boats for the greater part of the year. The flying boat returned to Basrah on July 13th.

On August 3rd one flying boat of No. 203 Squadron left Basrah with Air Marshal Sir Geoffrey Salmond, A.O.C., India, as passenger on a flight to Karachi. The route followed was Bahrein, Umm al Qaiwain, Ras al Khaimah and along the coast of Oman to Muscat and thence to Gwadar. At the latter place, in spite of a bad swell on the water, the aircraft was refuelled without difficulty and the flight continued to Karachi, which was reached on August 6th. On the return journey opportunity was taken to inspect sites for landing grounds at Sohar and Yas Island. At both places suitable sites were found. The flight continued to Bahrein, having covered a distance of 400 miles since refuelling at Ras al Khaimah, and arrived back at Basrah on August 16th.

MIDDLE EAST.

Service Flights.

The Nigerian Flight, which left Khartoum on September 15th, returned at the end of November, having completed the flight to Kano and back without incident. The Cape Flight will leave Cairo on January 11th, 1930. As on the Cairo-to-Baghdad route, the R.A.F. are blazing the trail for civil aviation on these routes into Nigeria and to the Cape. The latter route should by now have been reconnoitred sufficiently to hand it over to civil aviation. It is interesting to note that, on the return journey from the Cape in February, 1930, a flight from the South African

Air Force will accompany the Royal Air Force to Cairo, carrying the Inspector-General of the South African Air Force and the South African Chief of the General Staff.

The outstanding feature of these long flights has been the extreme precision with which the time-table has been maintained. This reliability in aircraft has caused a deep impression on Governors and the inhabitants all along the routes. The increased confidence in aircraft which has resulted has led to a far wider appreciation of the uses of aircraft for civil administration, notably in the Sudan.

PALESTINE AND TRANSJORDAN.

During the recent disturbances in Palestine, the Royal Air Force has been actively employed in assisting the Government in the tasks of restoring law and order in the numerous areas where rioting occurred and in preventing the further outbreak of disorders. At the outset the rapid movements of troops was of vital importance, and the transport by air of fifty infantrymen from Egypt on the day following the outbreak did much to assist the authorities in gaining control of the situation. During the period following the outbreak, aircraft were constantly engaged in carrying out demonstration flights and reconnaissances over the disturbed areas, and co-operating with the military forces in the searching of villages. The armoured car sections, by systematically patrolling the streets, assisted in the dispersal of mobs and the guarding of villages against attacks. During this phase ground detachments of Royal Air Force were employed at many points throughout the disturbed areas in maintaining order and preventing the rioters from committing acts of violence. Throughout the period there was a constant danger of incursions into Palestine of Bedouin tribes from Sinai, Transjordan and Syria. In some cases the frontiers were actually crossed, but further progress was successfully checked by the action of the aircraft and armoured cars in co-operation with the Transjordan Frontier Force.

In addition to the reinforcements of naval and military contingents which were dispatched to Palestine to deal with the situation, No. 45 Squadron and one flight of No. 208 Squadron were sent from Egypt and No. 3 Section Armoured Car Wing from Iraq. The full complement (six flights) of aircraft of the fleet air arm from H.M.S. *Courageous* was landed at Gaza. Air Vice-Marshal H. C. T. Dowding, C.B., C.M.G., assumed command of the forces in Palestine and Transjordan on September 12th.

By the middle of September the situation had so much improved that it was found practicable to make certain reductions in the strength of the forces. The withdrawal from Palestine of all His Majesty's ships, together with the fleet air arm flights and landing parties, was accordingly effected by September 14th.

Since the original outbreak of disorder no serious disturbances have occurred, and the situation is now quiet.

SINGAPORE.

Flying Boats.

Two more flights along the Singapore—Calcutta route have been carried out by aircraft of No. 205 (Flying Boat) Squadron during the period under review.

One flying boat left Singapore for Calcutta on August 6th and returned

on August 21st, and a second left on September 3rd and returned on September 18th. On both flights halts were made at Penang, Mergui, Rangoon, Akyab and Chittagong.

A third flight to Calcutta is now in progress.

The object of these monthly cruises is to gain practical experience of weather conditions from an aviation point of view during the whole of the monsoon period.

The value of these cruises from this aspect has been well demonstrated, as the conditions experienced during the first cruise to Calcutta in August were quite different from those met with on a flight to Rangoon in June. The worst conditions so far experienced occurred during the return of the flying boat from Calcutta in August, during which the monsoon rain was particularly heavy. The difficulties of flying through this tropical rain are somewhat similar to those of flying in fog with the added disadvantage of a strong wind, bumpy air conditions and the acute discomfort of the rain beating into the pilot's face.

In spite of these conditions, however, the aircraft have adhered to the time tables of the flights with only minor alterations.

SUDAN.

Further trials of aircraft fitted with float under-carriages were carried out in the swamp areas of the Sudan during August. The aircraft, proceeding from Khartoum, visited Malakal, Shambe, Yirrol, Mongalla, Wau, Lake No, Nasser and Abwong, successful landings being made at each of these places. A certain amount of difficulty was experienced in taking off, which it is hoped to overcome by the use of improved propellers and floats. As a result of these trials it is considered that the use of floatplanes is possible in most places in the Southern Sudan during the rainy season, which will enable aircraft to operate in the swamp areas which have hitherto been inaccessible to any form of military force.

Auxiliary Air Force and "Cadre" Squadrons

Personnel.

Group Captain W. F. MacNeece Foster, C.B.E., D.S.O., D.F.C., assumed command of No. 1 Air Defence Group, *vice* Air Commodore E. L. Gerrard, C.M.G., D.S.O., with effect from November 14th, 1929. Air Commodore Gerrard had been in command of the Group since August 9th, 1927. No. 1 Air Defence Group was started on May 14th, 1925, and the previous Air Officers Commanding were Air Commodore C. O. N. Newall, C.B., C.M.G., C.B.E., A.M., and Air Commodore J. G. Hearson, C.B., C.B.E., D.S.O.

The following are the units in No. 1 Air Defence Group:—

"Cadre" Squadrons.

No. 501 (Bomber) Squadron, Filton, Bristol. (Commanding Officer, Squadron-Leader R. S. Sugden, A.F.C.)

No. 502 (Ulster) (Bomber) Squadron, Aldergrove, County Antrim,

Northern Ireland. (Commanding Officer, Wing-Commander A. C. Wright, A.F.C.)

No. 503 (County of Lincoln) (Bomber) Squadron, Waddington, Lincs. (Commanding Officer, Wing-Commander Hon. L. J. E. Twistleton-Wykeham-Fiennes.)

No. 504 (County of Nottingham) (Bomber) Squadron, Hucknall, Notts. (Commanding Officer, Squadron-Leader C. H. Elliott-Smith, A.F.C.)

Auxiliary Air Force Squadrons.

No. 600 (City of London) (Bomber) Squadron, Hendon, Middlesex. (Commanding Officer, Squadron-Leader The Rt. Hon. F. E. Guest, C.B.E., D.S.O.)

No. 601 (County of London) (Bomber) Squadron, Hendon, Middlesex. (Commanding Officer, Squadron-Leader The Rt. Hon. Sir Philip A. G. D. Sassoon, Bart., G.B.E., C.M.G., M.P.)

No. 602 (City of Glasgow) (Bomber) Squadron, Renfrew, Glasgow. (Commanding Officer, Squadron Leader J. Fullerton.)

No. 603 (City of Edinburgh) (Bomber) Squadron, Turnhouse, Midlothian. (Commanding Officer, Squadron-Leader J. McKelvie, A.F.C.)

No. 605 (County of Warwick) (Bomber) Squadron, Castle Bromwich, Birmingham. (Commanding Officer, Squadron-Leader J. A. C. Wright.)

Royal Air Force Station, Hendon, Middlesex. (Commanding Officer, Wing-Commander W. J. Y. Guilfoyle, O.B.E., M.C.)

Whilst recruiting has varied naturally in various centres, on the whole a very high standard has been reached; in particular Nos. 602 and 603 are up to strength.

Training.

The great majority of the personnel had completed their training obligations before the annual camps. These were held during the months of July and August, and were attended at different times by the five Auxiliary Air Force Squadrons. No. 600 went to Tangmere, No. 601 to Lympne, Nos. 602 and 603 to Leuchars, and No. 605 to Manston.

A total of 5,589 hours were flown. This figure compared very favourably with that of last year and, indeed, with the averages of Regular squadrons. A considerable amount of liaison took place during the training between various Fighter Squadrons and Auxiliary Air Force Squadrons. Valuable co-operation was also carried out with the Territorial Army units, including four battalions of infantry, four anti-aircraft batteries, R.A., and with the South Midland Divisional Train, R.A.S.C.

Equipment.

The gradual process of re-equipment of the Auxiliary Air Force squadrons with Wapiti aircraft continues.

Formation of New Squadrons.

During the next year, the formation of three new Auxiliary Air Force squadrons is proposed:—

No. 604 (County of Middlesex) (Bomber) Squadron, Hendon.

No. 607 (County of Durham) (Bomber) Squadron, Usworth.
No. 608 (County of York, North Riding) (Bomber) Squadron, Thornaby.

The initial preparatory work on the aerodromes is proceeding.

The Esher Trophy.

The Esher Trophy for 1929 has been awarded to No. 602 (City of Glasgow) (Bomber) Squadron.

Oxford University Air Squadron

The year 1929 was marked by continued progress and development.

The University and the Air Ministry sanctioned solo flying by members of the Squadron in term-time, and this has raised the prestige of the Squadron and the keenness of its members still higher than before. Moreover, it has contributed to a further improvement in the standard of flying, as is proved by the results achieved at the annual attachment of the Squadron to the R.A.F. Station at Manston, in Kent.

Out of seventy-four members who attended the attachment, sixty-four flew solo, and of these as many as fifty-four completed a total of over three hours' solo each. The corresponding figures for 1928 were thirty-three and fifteen.

It is also satisfactory to note that, although members of the Squadron have flown over 1,700 hours during the year, they have caused no damage to a single aeroplane beyond ordinary minor replacements due to such things as punctured tyres or cracked tail skids on hard or rough ground.

As a result of the above, the Squadron has started the academic year 1929-30 with over thirty members (or nearly half its strength) qualified to fly solo in term-time, and of this number nineteen are sufficiently advanced to fly solo on machines of a Service type.

With regard to commissions, the University during 1929 provided thirty-one successful candidates for the Reserve of Air Force Officers. Of these officers, twenty-two were members of the O.U.A.S., the remaining nine being undergraduates not in the Squadron.

In addition, three commissions were obtained in the Regular Air Force.

The new academical year began in October, 1929, and, apart from the fact that there were between three and four applications for every vacancy, two notable events have already taken place.

A new Lecture Hall and Library has been provided, and was opened by Lord Thomson, Secretary of State for Air, in the presence of the Vice-Chancellor, General Smuts, the Mayor of Oxford, Air Marshal Sir E. L. Ellington, and other Air Ministry and University officials.

Secondly, the University has approved a modification to the regulations governing solo flying in term-time, under which a member of the Squadron can qualify for solo flying in one year instead of two, provided he makes sufficient progress to pass all the tests within a year.

The Squadron now has four Lynx Avros and two Bristol Fighters in

daily use at Upper Heyford Aerodrome, and this allows each member to get one flight a week without being away from Oxford more than two or three hours on each occasion.

Owing to the large number of men waiting to get into the Squadron, no member is retained who does not qualify for his Proficiency Certificate or who gets seriously behindhand with his training.

Cambridge University Air Squadron

THE Squadron year 1928-29 was a very successful one, and the following were the outstanding features:—

Eight members were given Permanent Commissions in the Royal Air Force.

Twenty-one members were given commissions in the Reserve of Air Force Officers.

Five members obtained appointments in civil aviation firms, and two have taken up aeronautical research, one of these at the R.A.E., Farnborough.

The new University year began in October, and the Squadron is again up to its full strength of seventy-five.

Nearly ninety applications were received for the thirty vacancies which occurred as a result of members having "gone down."

The Certificate of Proficiency examinations took place on December 2nd and 3rd.

ROYAL AUSTRALIAN AIR FORCE

THE KING.

Governor-General and Commander-in-Chief:
His Excellency the Right Hon. John Lawrence Baron Stonehaven, P.C., G.C.M.G., D.S.O.

Honorary Group Captain, R.A.A.F.:
(Group Captain, R.A.F.) His Royal Highness Albert Frederick Arthur George, Duke of York, K.G., P.C., K.T., G.C.M.G., G.C.V.O. (Personal A.D.C. to H.M. the King).

Air Aide-de-Camp to the Governor-General:
Wing Commander R. S. Brown, A.F.C., *p.s.a.*
Wing Commander L. J. Wackett, D.F.C., A.F.C., B.Sc., A.F.R.Ae.S., M.I.Ae.S. (Hons.).
Squadron Leader R. J. Brownell, M.C., M.M.

THE DEPARTMENT OF DEFENCE.

Minister of State for Defence.

Secretary:
M. L. Shepherd, Esq., I.S.O.

Council of Defence:

Air Force Member	Air Commodore R. Williams, C.B.E., D.S.O., *p.s.a.*
Assistant Secretary (Air Force)	

Air Board:

First Air Member	Air Commodore R. Williams, C.B.E., D.S.O., *p.s.a.*, Chief of the Air Staff.
Second Air Member	Group Captain S. J. Goble, C.B.E., D.S.O., D.S.C., *p.s.a.*, Air Member for Personnel.
Finance Member	A. C. Joyce, Esq., A.I.C.A.
Secretary	P. E. Coleman, Esq., O.B.E.

AIR FORCE HEADQUARTERS.

Branch of the Chief of the Air Staff:

Chief of the Air Staff	Air Commodore R. Williams, C.B.E., D.S.O., *p.s.a.*
Director of Operations and Intelligence	Squadron Leader T. F. W. Thompson, D.F.C., *p.s.a.*, R.A.F.
Director of Organization and Staff Duties	
Director of Air Force Works and Buildings	Squadron Leader A. Hepburn, D.F.C., C.E., A.M.I.E.
Director of Supply	Wing Commander W. H. Anderson, D.F.C., *p.s.a.*

Branch of the Air Member for Personnel:

Air Member for Personnel ...	Group Captain S. J. Goble, C.B.E., D.S.O., D.S.C., *p.s.a.*
Director of Training	
Director of Personnel Services ...	Squadron Leader R. J. Brownell, M.C., M.M., A.D.C.
Director of Manning	Flight Lieutenant C. C. Eaton.
Director of Air Force Medical Services	Wing Commander A. P. Lawrence, M.C., M.B., B.S., F.R.C.S. (Edin.), D.O.M.S. (Lon.).

LIAISON OFFICE, LONDON.

Room 523, Australia House, Strand, W.C.2.

Liaison Officer	Squadron Leader H. N. Wrigley, D.F.C., A.F.C., *p.s.a.*
Assistant Liaison Officer ...	Flight Lieutenant C. J. Harman.

NO. 1 FLYING TRAINING SCHOOL.

Point Cook, Victoria.

Commanding Officer ... ... Wing Commander R. S. Brown, A.F.C., *p.s.a.*, A.D.C.

NO. 1 AIRCRAFT DEPOT.

Laverton, Victoria.

Commanding Officer ... ... Wing Commander A. T. Cole, M.C., D.F.C., *p.s.a.*

NO. 1 SQUADRON.

Laverton, Victoria.

Commanding Officer ... ... Squadron Leader J. H. Summers.

NO. 3 SQUADRON.

Richmond, New South Wales.

Commanding Officer ... ... Squadron Leader F. W. F. Lukis.

NO 101 FLIGHT.

Embarked in H.M.A.S. *Albatross.*

Commanding Officer ... ... Squadron Leader A. E. Hempel.

IT was reported in *The Times* of November 8th that the Commonwealth Ministry was proposing the discontinuance of the Royal Australian Air Force as a separate unit contrary to the recommendations of Air Chief-Marshal Sir John Salmond after his visit last year to Australia. This, with other proposals, was being considered by the Defence Council, and the proposal was made on the grounds of economy.

In contrast to these proposals, it is interesting to record a statement made by a Member of the Australian Parliament before the Committee of Supply on the 1929-30 Estimates. He said, " When we establish these specialized professions, we cannot drop them and pick them up later without suffering a tremendous loss in efficiency." In order to effect such proposals, it would be necessary to repeal an Act of Parliament—the Air Force Act—and it is thought that such a step would not be undertaken lightly. Apart from this, a change to the old system of a Naval and a Military Air Branch would have the opposite effect to the one intended—economy—for one of the principal arguments in favour of a separate Air Force has been that it ensures, by co-ordination, greater efficiency and economy.

In his speech at the opening of the Federal Parliament, the Governor-General said :—

"Compulsory military training has been suspended. The Council of Defence have agreed to the maintenance of the same Army organization as hitherto as a nucleus. The number necessary will be raised by voluntary enlistment. The decision of Council of Defence on the question of maintaining a separate organization for the Air Force raised by Officers of the Defence Department has been postponed pending a comprehensive review of the position of the Air Force. The Ministers have requested a report on the possibilities of co-ordinating the work of the Air Force and Civil Aviation."

Appointments.

Squadron-Leader H. C. Harrison has completed a term of two years' exchange duty with the R.A.F. and embarked at Southampton on October 5th for return to Australia via America. Whilst in the U.S.A. he will study American technical methods, construction and design, etc.

Squadron-Leader A. H. Cobby, D.S.O., D.F.C., after completing a course at the R.A.F. Staff College, spent a further twelve months with R.A.F. units studying Army Co-operation, and embarked for Australia on October 8th.

Flight-Lieutenant A. M. Charlesworth, after completing the Short and Long Courses at the School of Photography, embarked on October 12th for Aden for duty with the R.A.F.

Squadron-Leader H. N. Wrigley, D.F.C., A.F.C., who has been the Liaison Officer at the Air Ministry since February, 1929, will embark for Australia at the beginning of the year, and, according to present advice, will resume duty as Director of Organization and Staff Duties at the R.A.A.F. Headquarters. His duties here are to be taken over temporarily by Flight-Lieutenant W. Palstra, M.C.

Flight-Lieutenants F. M. Bladin and D. E. L. Wilson have been nominated by the Air Board to attend the eighth course at the R.A.F. Staff College.

Defence Estimates, 1929-30

The following are extracts from the speech made by Mr. Bruce, the Prime Minister, before the Committee of Supply on August 23rd, 1929.

(Reproduced from "Aircraft," September 30th, 1929.)

With regard to the aviation arm of defence, great progress has been made during the last five years as part of a general defence programme embracing the Navy, the Army, munitions, and air services. The main part of that programme related to the Navy, and the greatest expenditure during that period has been on the naval side. In that respect we have reached the point that we set out to attain. We have now two modern first-class 10,000-ton cruisers, two ocean-going submarines, a seaplane carrier, and certain oil storage, and this, I think, must be taken as the maximum contribution that, at the moment, we can make to the Navy. We had hoped, on the completion of that programme, to give effect to

the three-years' development programme for the Air Force laid down by Sir John Salmond; but the finances of the country at the moment will not permit of the further expansion of defence, and we have to be content with the maintenance of that which we have achieved as a result of the completion of the five-years' scheme. Our intention in regard to the Air Force was to build up gradually the necessary ground work for co-operation with the Army and Navy, and to re-equip the Air Force with modern machines. Great progress has been made in both these directions. Our expenditure on aviation for 1927-28 was £437,902; for 1928-29, £558,147; and for the present year the estimate is £614,179. In addition, supplementary amounts have been made available. In 1927-28 the amount was £85,813, and in 1928-29, £106,000. Those amounts were provided from the special Defence provision made for the five-years' programme. Substantial results have followed from that expenditure, and to a certain extent the ground work has been completed. In 1924 all that we had was a small training station at Point Cook, Victoria, and the experimental section in New South Wales. During the five years that have since elapsed, the aircraft depot at Laverton has been established and has provided for the housing of all aircraft and stores not issued to units, and a workshop for the repair of aircraft, aero engines, motor transport, wireless, photographic, gunnery and other material.

In addition to the Laverton depots, Nos. 1 and 3 composite squadrons, at Point Cook and Richmond respectively, have been established, as well of No. 101 Flight, a fleet co-operation flight in Queensland, which has been co-operating with the work that has been carried out recently along the Barrier Reef. That flight will now pass to the "Albatross." At the present time only seven of the old aeroplanes are still in use, and the whole of the force is gradually being re-equipped. After the war Australia received a number of gift aeroplanes from the British Government, and these were perfectly good and sufficient for our purposes at that time. But tremendous developments have taken place in regard to types of machines, and that development is likely to be progressive. Machines which to-day are completely up-to-date, whether for fighting purposes or reconnaissance work, will in the course of a year or two be out of date, and probably we shall have to re-equip further in the future. Seventeen de Havilland "Moths" are being constructed in Australia for training purposes, whilst eleven Westland "Wapitis" for general purposes, and eight Bristol "Bulldog" single-seater fighters are due to arrive in Australia during the present year. The squadron on the "Albatross" will be re-equipped as soon as a determination is reached as to what is the most suitable type of seaplane for the purpose.

I remind honourable members that Australia benefits from the experimental work that is carried out at tremendous cost by the British Government. In Great Britain a machine is produced, sent into the air and tested. It may give satisfaction for a time, but eventually prove not altogether suitable and further experiments have to be made. The experiments to decide the most suitable type of aeroplane have not yet been completed. When the British Government has decided upon the most suitable type and made a final selection we shall probably adopt it. The planes that we now have were selected after the fullest examination and in the light of the experimental work and experience of the British

Air Force. There is no justification for the statement that the existing force is useless, or that it is not a very efficient fighting force judged by modern standards. We shall be re-equipped with modern planes before the British Air Force is so equipped. The size of our force, of course, is limited by the expenditure that it is possible to incur upon this arm of defence. While there may be differences of opinion regarding what is our primary line of defence, the Government takes the view that the sea is our first line, and consequently its policy has been to incur the maximum expenditure in that direction.

It has been suggested that it was a mistake to close down the experimental station at Randwick. I claim that it was wise for the reason that the station was very little use on the basis on which it was being conducted. Wing-Commander Wackett has endeavoured to carry out experimental work in this very restricted area. Unless we are willing to incur, as Sir John Salmond pointed out, a tremendous recurring expenditure on the expansion of that experimental station there is no scope for its existence. A man of Wing-Commander Wackett's capacity would probably be of much more value when engaged in experimental work, the expenditure upon which was sufficient to give him full scope for his talents. If the honourable member for Dalley (Mr. Theodore) sought to make the point that it was desirable to establish a splendid experimental station in Australia, and that Australia should stand side by side with the United States of America, Great Britain and other countries in the development of this means of communication and defence, I entirely agree with him; but the point is that our finances at the present time will not permit us to even contemplate the expenditure that would be involved in experimental work that would produce results of real value to the development of aviation in Australia. There is not the slightest use in engaging in the work on a small scale. That is the advice which was given by Sir John Salmond.

I concur in the view that it should be possible to make tests of aero engine in Australia, particularly as we stipulate the conditions that must be fulfilled before any engine can be used for the purposes of flying. Arrangements are now being made to enable tests to be carried out. That work will be continued in future and the necessary facilities will be provided.

The honourable member for Dalley also stated that the planes used by our Air Force are manufactured abroad and suggested that we should manufacture those that we require. I suggest to the honourable member that we have not yet reached the stage at which we could contemplate doing that. We must have the best equipment it is possible to obtain for our Air Force, so that if it is to be used for war purposes our men will not be handicapped in any way. Millions of pounds are being spent by all the great nations in the development of aviation. It is impossible for us to keep abreast—let alone ahead, as we ought to be—of those developments. We benefit from the expenditure that Great Britain incurs, and the time has not yet arrived for us to contemplate putting our men into the air in machines that have been produced in Australia. We have not yet even reached the stage at which we can produce an engine for a motor-car. Therefore, we should be going a little too fast if we contemplated entering the more complicated field of the manufacture of an aeroplane engine, particularly in view of the experience of a great country like the United States of America, which

during the war set out to provide all the fighting planes her force needed, but could not do so. We must walk before we run. We cannot contemplate the manufacture of aeroplane engines until we have solved the problem of manufacturing motor-car engines on a commercial basis.

Production cannot be carried on successfully unless there is a market that offers a wide scope for it. To be progressive you must have a large market in which to sell your product. The market for aeroplane engines in Australia at the present time is very restricted, and it would not enable us to produce successfully and efficiently in comparison with the rest of the world. I cannot concur with the honourable member when he suggests that Australia at the present stage of its development can move into the field for the manufacture of aeroplane engines.

We recognize that aviation is a great and progressive science, and that we are not entitled to rest on our laurels and be content with what has been achieved. The Government proposes to continue its policy of fostering the development of civil aviation in Australia to its maximum capacity. That is shown by the fact that notwithstanding the financial stringency—necessitating economies in every direction—with which the country is at present faced, it is proposed to spend £250,165 on civil aviation during the coming year as against an expenditure of £139,612 last year. There could be no better earnest of the fact that this Government realizes that aviation is a vital and important factor in the development of Australia.

The Government fully appreciates the importance of air services, both for defence purposes and also for the development of means of communication, and as soon as the financial circumstances of the country warrant we shall be prepared to foster and advance the progress and development of aviation in Australia.

AIR ESTIMATES, 1929-30.

R.A.A.F.

	1927-28 £	1928-29 £	*Estimate* 1929-30 £
Civilian Staff—Pay	6,801	8,439	16,500
R.A.A.F.—Pay	193,159	213,000	245,700
Miscellaneous	2,577	5,886	1,000
General Contingencies	74,273	79,346	90,000
General Stores and Maintenance of Aircraft, Vehicles and Equipment ...	35,096	32,087	81,000
Repairs, Maintenance, Fittings and Furniture	7,559	8,296	10,000
Rent of Buildings	134	234	450
Provision of Aircraft Equipment and Plant	8,000	55,015	55,000
Construction of Buildings, Hangars, Workshops, Barracks and Earthworks, and Preparation of Aerial Routes and Landing Grounds ...	103,154	39,551	91,478
Purchase of Properties and Sites ...	73	979	1,000
Allocation of Interest on Loans ...	18,553	22,226	27,650
Total R.A.A.F.	£449,379	£465,059	£619,778

CIVIL AVIATION.

	1927-28 £	1928-29 £	*Estimate* 1929-30 £
Civil Aviation Branch—			
Pay	10,322	11,226	15,918
Contingencies	3,335	3,980	4,200
General Stores and Maintenance of Aircraft, Vehicles and Equipment	1,109	1,300	1,750
Miscellaneous	519	779	1,000
Development of Civil Aviation ...	49,985	50,990	75,332
Repairs, Maintenance, Fittings, and Furniture	5,945	4,512	7,000
Rent of Buildings	538	712	800
Total Civil Aviation	£71,753	£73,499	£106,000
Total Air Services	£521,132	£538,558	£725,778

THE ROYAL CANADIAN AIR FORCE

Director of Air Services (Acting) Wing Commander L. S. Breadner, D.S.C., *p.s.a.*

R.C.A.F. TRAINING STATIONS.

Camp Borden, Ontario:

Officer Commanding ... ... Wing Commander G. M. Croil, A.F.C., *p.s.a.*

Vancouver, British Columbia:

Officer Commanding ... ... Flight Lieutenant (temporary Squadron Leader) E. L. McLeod.

R.C.A.F. Communication Flight, Ottawa:

Officer in Charge ... ... (Attached to Ottawa Air Station).

CIVIL GOVERNMENT AIR OPERATIONS.

Director ... ... Group Captain J. L. Gordon, D.F.C., A.D.C., *p.s.a.*

Stations:

Winnipeg Air Station, Manitoba:

Officer Commanding ... ... Squadron Leader N. R. Anderson, *p.s.a.*

High River Air Station, Alta.:

Officer Commanding ... ... Flight Lieutenant A. A. Leitch, M.C., D.F.C.

Ottawa Air Station, Ontario:

Officer Commanding ... ... Flight Lieutenant (temporary Squadron Leader) R. S. Grandy.

Dartmouth Air Station, Nova Scotia:

Officer Commanding ... ...

No. 1 Depot, Ottawa, Ontario:

Officer Commanding ... ... Wing Commander W. R. Kenny, D.F.C., *q.s.*

Photographic Section, Ottawa, Ontario:

Officer Commanding ... ... Flight Lieutenant E. R. Owen.

AERONAUTICAL ENGINEERING.

Chief Aeronautical Engineer ... Wing Commander E. W. Stedman, O.B.E.

LIAISON OFFICE, AIR MINISTRY, LONDON.

Liaison Officer ... ... Squadron Leader A. B. Shearer.

THE Director, under the Chief of the General Staff, administers and controls the Royal Canadian Air Force; its organization comprises the Permanent Force, Non-Permanent and Reserve. There is also a scheme for providing flying training for students attending Canadian universities. They attend at the R.C.A.F. Station, Camp Borden, Ontario, for training during the summer months for three consecutive years, and are granted provisional pilot officers' appointments during these periods. At the end of their training they are either given Permanent or Non-Permanent appointments or placed on the Reserve.

The Royal Canadian Air Force not only provides for trained personnel for air defence purposes, but also for Civil Government Air Operations to carry out forest protection, survey and other miscellaneous work.

Training is carried out on lines similar to that of the Royal Air Force. There are two training stations: one at Camp Borden, Ontario, for landplanes, and the other at Vancouver for seaplanes.

EXTRACT FROM ESTIMATES, 1929-30.

AIR SERVICES.

	1929-30 $	1928-29 $
Royal Canadian Air Force—All expenses in connection with the general maintenance and training of the Royal Canadian Air Force and Reserve Air Force, including training personnel for Civil Air operations	1,697,694	1,697,694
Civil Air Operations—Flying operations for Civil Government Departments in connection with aerial photographic surveys, forestry patrols, forestry and grain pests, transportation, etc.; control of civil aviation, establishing air routes, aerodromes and airship bases, aeronautical engineering, etc.	3,658,469	3,345,037
	$5,356,163	$5,042,731

SOUTH AFRICAN AIR FORCE

Air Directorate.

Headquarters	Roberts' Heights, Pretoria.
Director of Air Services ...	Colonel Sir H. A. van Ryneveld, K.B.E., D.S.O., M.C., S.A. Staff Corps.
Staff Officer	Lieut.-Colonel K. R. van der Spuy, M.C., S.A.A.F. (Attached S.A. Staff Corps).
Staff Officer (Air Equipment) ...	Lieut.-Colonel F. R. G. Hoare, C.B.E., S.A.O.C. (Attached S.A. Staff Corps).

No. 1 Flying Training School.

Headquarters	Zwartkop Air Station, Pretoria.

No. 1 Squadron.

Headquarters	Zwartkop Air Station, Pretoria.

Aircraft Depot.

Headquarters	Roberts' Heights, Pretoria.
Officer Commanding	Major J. Holthouse, O.B.E., S.A.A.F.
Adjutant	Lieutenant N. C. P. Mostert, S.A.A.F.

Reserve Aeroplane Park.

Headquarters	Roberts' Heights, Pretoria.

Transvaal University College Air Squadron (Active Citizen Force).

Headquarters	Pretoria.

Air Display.

A display was given by the South African Air Force at Baragwanath, near Johannesburg on October 19th.

Included in the events were:—

(1) A Message Picking-up Competition.
(2) A demonstration of Balloon-chasing at a height of 1,000 feet over the aerodrome.
(3) Air combat between one D.H.9 and two S.E.5a's.
(4) A converging bombing attack by three S.E.5a's.
(5) Formation flying.

Equipment.

The Avro Avian (Genet Major engine) has been adopted as the standard training machine.

Several Westland Wapitis are in service, and this type has been chosen as the standard General Type machine.

NEW ZEALAND AIR FORCE

G.H.Q., Wellington.

Director of Air Services ...	Wing Commander S. Grant-Dalton, D.S.O., A.F.C.

N.Z.A.F. Base, Auckland.

Officer Commanding	Major L. M. Isitt.
Instructor	Captain S. Wallingford.

Wigram Aerodrome, Christchurch.

Officer Commanding	Captain M. W. Buckley.
Instructor	Captain H. B. Burrell.
Equipment Officer	Lieutenant T. J. Denton.

Duty with Royal Air Force.

Dominion Liaison Officer ...	Major T. M. Wilkes, M.C., Air Ministry, London.
Undergoing Courses	Major J. L. Findlay, M.C.

The New Zealand Permanent Air Force is a unit of the Permanent Military Forces.

The New Zealand Air Force is part of the Territorial Forces, no definite unit has yet been formed, but the strength is some 100 officers and 20 other ranks.

The New Zealand Permanent Air Force at present consists of 8 officers and 17 other ranks, with headquarters at General Headquarters, New Zealand Military Forces, Wellington, and two stations—

(*a*) New Zealand Air Force Base, Auckland, North Island, and
(*b*) Wigram Aerodrome, Christchurch, South Island.

An increase in the number of other ranks is at present being made, and will be largely effected by the enrolment of apprentices for training in the various trades.

The work of construction at New Zealand Air Force Base, Auckland, is not yet completed but is progressing rapidly. This station will accommodate both landplanes and seaplanes. At present two Fairey IIIF's and a Gipsy Moth are the only aircraft equipment held. These machines are provided with alternative land or sea under-carriages and, pending the completion of the seaplane accommodation, they will be operated as landplanes.

Wigram Aerodrome, Christchurch, is equipped as a Flying Training School, and in addition accommodates an Army Co-operation Flight (Bristol Fighter). This station will ultimately accommodate a bombing and reconnaissance unit in addition to the above.

Aircraft held at Wigram Aerodrome include Gipsy Moths, Avros (mono),

Bristol Fighters (Falcon), Grebes (Jaguar), D.H.4s. (Eagle) and a D.H.59 (Puma).

In addition to training of cadets for service in the New Zealand Air Force—the Territorial unit—and giving refresher training to pilots of that force, the permanent personnel undertake a certain amount of air photography for various Government departments.

(SUB-SECTION OF DEFENCE—ARMY VOTE.)

Military Aviation.

(Total Vote, £53,097.)

Principal Items :—

	£
Pay	8,807
Pay—New personnel	5,930
Maintenance, Buildings and Plant	1,000
Instruction Abroad	1,720
Refresher Courses, New Zealand Air Force...	1,500
Purchase Aircraft and Spares	28,500
Purchase Spirit, Oil, etc.	2,000
Other items not specified	3,640
Total Military Aviation	£53,097

Civil Aviation.

(Total Vote, £7,300.)

Principal Items :—

	£
Purchase of Aircraft for Loan to Clubs	4,500
Grants to Clubs for Pupils Trained	1,500
Grants to Assist Air Pageants	1,000
Other items not specified	300
Total Civil Aviation	£7,300

Total Aviation Vote (Military and Civil), carried on Defence Vote £60,397

(*Note.*—In New Zealand " Defence Vote " is the title given to the *Army* Vote and does not include expenditure in connection with the Navy.)

TRANSJORDAN

An Ancient and a Modern Raid

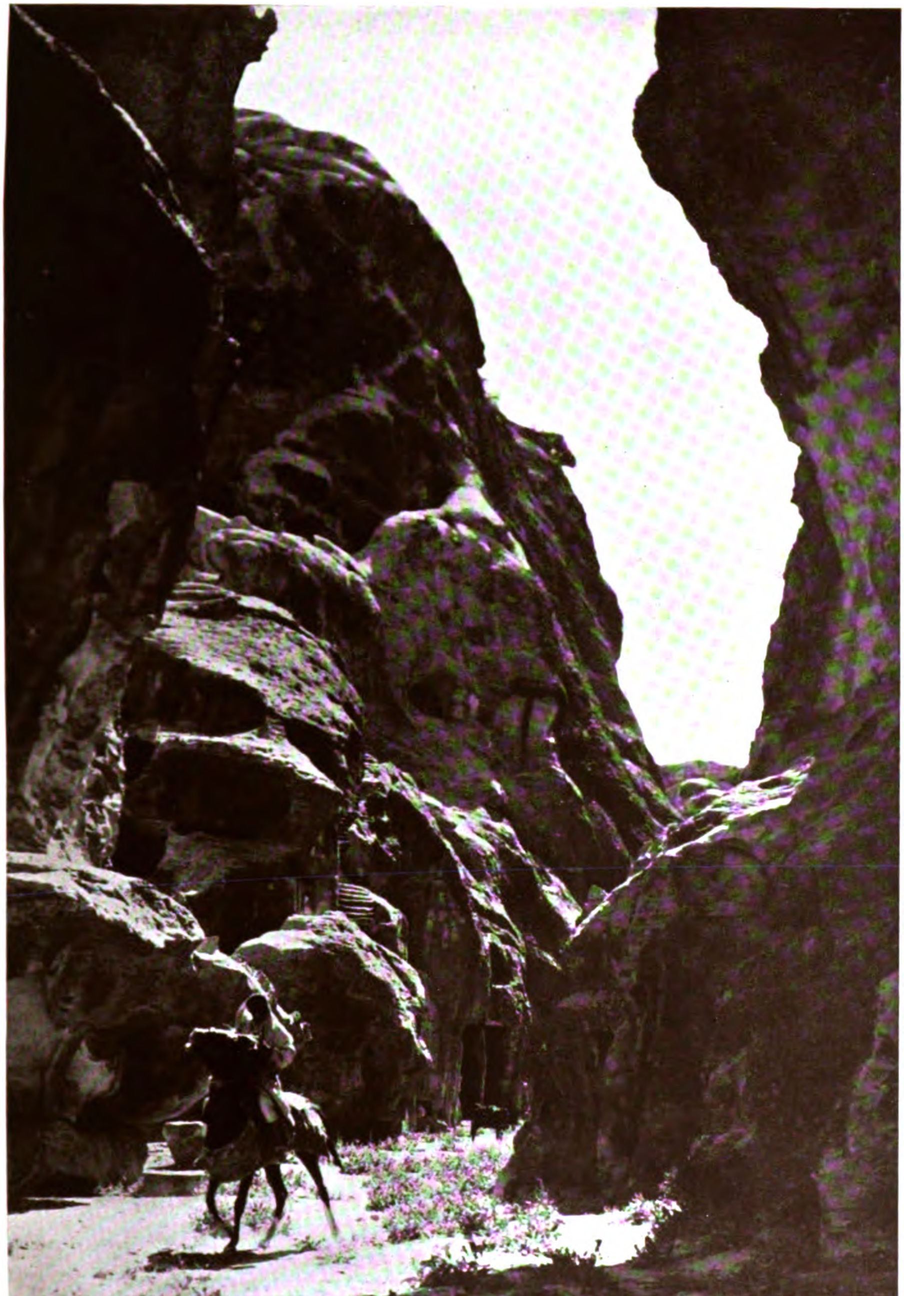
By Group Captain L. W. B. Rees, V.C., O.B.E., M.C., A.F.C., A.D.C.

References are to Dr. Moffat's translation of the Bible, and to pages in Lawrence's "Revolt in the Desert."

This paper was originally compiled by the author for his own amusement with the idea of finding out for himself, if possible, the truth of the Old Testament story of the Exodus, so far as Transjordan was concerned, and whether he, from the point of view of an ignorant air observer, could gain such a knowledge of the country as would convince him that the story was more likely to be true than otherwise. The author's conclusions are that he is convinced that the story of the Exodus through Transjordan is true, word for word, although his identfication of words and places may not be true in detail.

For the past few years the writer has been privileged to traverse Transjordan by air and car, and therefore has been in a much better position than his predecessors to appreciate the country. Those who preceded him travelled under difficulties, hurriedly, and at the risk of their lives.

Much of the country is rough and elevated, which necessitates an aeroplane travelling at such a height that in the event of a forced landing, a favourable part of the desert can be selected. At this height the country appears as though it were a raised and coloured map, and, as visibility is usually good, except when it is raining or snowing, it is possible to obtain an idea of the country over a radius of at least fifty miles at the same time. Here the air observer has an advantage over those on the ground, who, for the greater part of the year, move in a mirage which distorts things, even as close as a few miles to an unrecognizable degree. From the height at which many of the air reconnaissances are flown, details of the ground cannot be picked out, but there is a compensation. By obtaining a panoramic view of the country, grazing-grounds and camel-roads can be identified, and it is surprising to find that there is no desert as such in Transjordan, and the various grazing areas and main routes stand out quite clearly. This does not mean that at times the country is not



[Photo:] American Colony, Jerusalem.

Cliffs and rock cuttings of Al Barid (Petra).

Notice shade under rocks, and compare the name Barid (Cool) with Zalmonah (Shade).

deserted, but that at the proper seasons the country is habitable and inhabited. In November, 1928, the writer travelled for a fortnight all over the south-east of Transjordan with about a dozen people, all Arabs except one, in two taxis, living on the country.

On the long routine air reconnaissances, some of which lasted for about seven hours, there was often little of Service interest to be seen, and so long as the landmarks could be identified there was little else to do but to contemplate. One's thoughts in such a country naturally turned to stories of ancient raids, which, with memories of the Great War, inevitably merged into the great modern raid, that of Lawrence of Arabia. The Israelite raid and the Lawrence raid synchronized to a point, being roughly equidistant in time from the commencement of the Christian era.

Reference to such literature of the older period as was available yielded little of interest. No writer has written with a knowledge of the country or from the point of view of one who has either raided or stopped raids. Most of the writing consisted simply of a comparison of documents. The Revised Version of the Bible was of no use, as the print was too small for study, and the story made no sense whatsoever. The writer, therefore, referred to Doctor Moffat's translation of the Bible, to whom he would like to tender his thanks. A Bible concordance was used for translating the Hebrew names, and an Arab dictionary for making, where possible, comparisons of these names with the present-day names. Lawrence's "Revolt in the Desert" tells the story of the more recent raids.

Before making a comparison of the raids, the writer will endeavour to give a description of the country and the meaning of the Biblical names, so that plàces may be identified as far as possible. The description will be mostly that of the country as seen from the air, supplemented where necessary as seen from an armoured car.

When a course is set from Cairo to Amman, the Suez Canal is crossed somewhere near Kantara (قنطرة = bridge), and the short route is then via Beersheba[1] (the Oath Well), across the eastern edge of the Negb,[2] and over the Dead Sea[3] (Lot's Sea). The word "Negb" (Naqab) in Arabic has to do with boring holes, and it connotes the sudden drop from the high ground to the plateaux through which channels have been bored by the steep little water-courses. There are "Negbs" (Anqab) all over the country, but the Bible story refers to this particular one near Beersheba. After leaving the hard ground near the Canal, there is a patch of sandy desert,[4] complete with sand-dunes and a few small oases, that lies south of the fortifications that later were called Pelusium. This is actually the only patch of real desert in the whole section of the country with which we are concerned.

[1] Gen. xxi. 31. [2] Num. xiii. 17*b* and 29; Gen. xiii. 1. [3] Gen. xiii. 12. [4] Ex. xv. 22.

It is soon crossed, and, as one nears the Wadi el Arish[1] (Wadi of the carriage shaft— العريش), it is evident that the whole country, to the limit of visibility, has at some time been under cultivation. It has been necessary to make a slight deviation to the north, in order to avoid the hill-country at the north of the Sinai Peninsula, and so as not to get too far away from the railway. Soon the Negb comes into view, running into the hills of Sinai and forming the valleys at the head of the Wadi el Arish.

The landmark is now a small triangular hill on the eastern edge of the Negb, and on a clear day this mark can be seen from the sea. As the mark is approached, it is necessary to gain height, and so we ascend from about 2,000 to 6,000 feet, in order to cross the Negb at a safe height. To the south, invisible in the distance, are the Holy Wells[2] (Kadesh—Ain Kudeis). On reaching the mark, we leave the Amman course and fly directly into the Wadi Araba, south of the Dead Sea, and then due south to Akaba[3] (عقبة = the end, or difficult), the end of the Araba,[4] or "the awful Wadi." The drop into the Araba is very sudden, but, the edge once crossed, it is safe to lose height, as there are plenty of good landing-grounds and mud flats in the Araba, such as Taba (? Taberah—burning).

On the way south, it is noticeable that the country is full of evidence of ancient cultivation, tels, ancient villages, Roman towers, etc. On the western side of the Araba, about half-way to Akaba, the ruin of an old town can be seen, which, on examination, proves to be Roman. All the wadis round the town have at some time been damned up, and irrigation channels have been led for long distances to the cultivated areas round the town.

The aerodrome at Akaba is just north of the Gulf. The surface is hard sand, but, because sand-dunes form in a few days, it is necessary to give notice before the machines can land, in order that the ground may be swept. There always seems to be a wind blowing from the Araba into the Gulf. From the air, the sand can be seen extending for a little way under the waters of the Gulf, and then coming to a sudden end in the deep water, which is a perfectly wonderful sapphire colour. The whole area is covered with ostraca—broken utensils of all kinds; and wherever there is a little bush the growth sprouts from a small mound, the top of which is covered with mica that flashes like flakes of gold in the sun. There are various tels round the village, one of which could well go by the name of the "Giant's Backbone"[5] (Ezion-Geber), but this place was probably west of the Araba.

There is plenty of water, for wells can be dug anywhere in the sand near the seashore, and most of these produce fairly fresh water.

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[1] Josh. xv. 47. [2] Num. xx. 1, 14, 22; Deut. i, 46. [3] Num. xxi. 1; Deut ii. 1. [4] Deut. ii. 8; Deut. i. 19. [5] Num. xxxiii. 35; Deut. ii. 8.

It is always so hot here (sometimes 120 degrees in the shade), that a height of 2,000 feet must be gained before an aeroplane can begin to climb properly; and one's skin peels even if one is more or less acclimatized to the heat farther north.

From Akaba there are two possible air routes to Amman, one which is fairly direct, and the other that deviates considerably eastwards towards the Wadhi Sirhan (سيحان = flowing with the water). Leaving Akaba and taking the first route, one climbs as quickly as possible, and sees at once the narrow Wadi Ithm (عتم = dark) on the right, Across the wadi mouth there is a dam and just outside is a ruin. The wadi is so narrow that it nearly always affords most welcome shade[1] (Zalmonah = shade). Here the mountains are of grey granite, lined with a large criss-cross of dark, olive-coloured seams; but as we proceed northwards the whole country gradually changes to red, as the grey granite gives place to red conglomerate, which in turn gives place to the red Nubian sandstone that lies under the layers of white limestone. Near the Dead Sea, when the sun is right, the cliffs glow with every conceivable, and almost inconceivable, colour. As is usual in such places, the colours and the whole scene, as observed from the air, are quite indescribable.

However, this route is too rugged for safe normal travelling, and it is necessary to turn sharply eastwards to cross the col that divides the Petra and Shobek group of mountains from the Tafileh group. Just underneath the aeroplane as we turn are the ore-pits of Fenan[2] (Punon = ore-pits) that have been worked from the earliest times. In order to cross the col, the machine has to climb to 6,000 feet, and, as soon as the crossing has been effected, the ground is only some 2,000 feet below.

Again the view becomes interesting. To the south lies the Roman town of Odroh on the Roman road, and beyond it is Ma'an (fountains or habitations), the last station now used on the Hejaz Railway. Almost underneath is a square Arab fort (copied from the Roman pattern), built largely of stone full of fossils, whilst to the south-west is the valley that hides Petra.[3] To the north are two extinct volcanoes and a third lies almost underneath. One of the volcanoes is near the top of the mountains near Tafileh, and therefore forms a good landmark. From this volcano the basalt has oozed out eastwards, and the flow extends from the top of the mountain to the wadi near the station of Jurf el Derwish (the cliff edge of the dervish). The more easterly Roman road runs north and south along the Hejaz Railway, and the basalt is covered with cairns—the remains of flint-age houses and cattle-pens. Flints lie scattered everywhere.

In the distance to the east can be seen the great mud-flat of the Jefer

[1] Num. xxxiii. 41. [2] Num. xxxiii. 42. [3] Gen. xxxvi. 20; Deut. ii. 12.

Depression, the centre of an almost flat water-catchment area. The aeroplane is now on the edge of those grazing plains which could well be the Plains of Midian[1] (strife); and if the volcanoes were active at the time of Moses, the Burning Bush[2] might easily have been close to the volcano on the hills near Tafileh.

A prominent feature of the whole country along the railway for some twenty miles between Aneiza and Jurf el Derwish stations are the markings on the ground, visible only from the air. Turkish and Arab tent sites can be picked out distinctly, and there remain a great number of what are apparently tent sites; but here the tents are arranged in circles, being quite different from the present-day arrangement of the Arabs, who pitch their tents in straight lines or gentle curves. Oboth[3] (bottles) must be somewhere near here, but the markings have no apparent connection with bottles, unless it was that the Israelites had to carry water long distances from the Wadi el Hesa. Oboth was near the holy mount of Horeb[4] (dry), so that the word may mean place of worship (عبد = adore).

Having reached the Hejaz Railway, we are almost due south of Amman, and here we turn northwards. We fly more or less near the line of the railway, which is also the line of the Haj (pilgrim) route to Mecca, because to the westward are deep wadis with almost vertical sides, such as Hesa (stony), Arnon[5] (swift), and Zerka-Maiïn (blue fountains). To the eastward of the railway are few old town sites, whilst to the westward the country is full of them. To the eastward there are practically no cisterns, whilst to the westward the country contains hundreds in groups near every town site.

Just south of Jurf el Derwish station there is a curious circle, about 100 yards in diameter. It is near a town site covered with flints. There are two more on the Haj route just north of the Kalaat el Hesa (pilgrim fort). All three are almost exact circles, are different from anything else in the country, and two of them have produced flints, the third being unexamined. There is a pumping station at el Hesa, and the pools lower down the wadi provide some of the best sand-grouse shooting in the country. Perhaps these pools have to do with Oboth (bottles). We will hardly be far enough westward to see Tafileh, Kerak, and the ruins on the main Roman road, but we pass over the Roman and the ancient town site near the station of Fre-fre (where the tents flap). Soon one branch of the Arnon comes in from the eastward, and we follow it for a short distance. In 1928 the rains started in the " desert " to the east, and as we flew along this branch of the wadi the water had just reached it. There was a white wave rushing down the wadi bed which was quite dry beyond and lower down.

[1] Ex. iii. 1. [2] Ex. iii. 2. [3] Num. xxxiii. 43; Num. xxi. 10. [4] Ex. iii. 1; Ex. xvii. 6. [5] Num. xxi. 13; Deut. ii. 24.

The next remains of interest are at Katrani. Here the Arnon turns off westward into the Dead Sea. Below is the Haj Kalaat (pilgrim fort) and tank, and just north-west is another fort of much the same type. From the east a second branch of the Arnon comes in through a gap in the hills. A large mud-flat with a ruin at its south-west corner can be seen just beyond the hills. The mud-flat is part of the Arnon water-catchment area, and is fed by tributaries that rise in Jebel el Hadi (هادي = one who gives a present; Mattanah[1] = gift), not far from Bair Wells.[2] Away in the distance eastward are the three white peaks of the hill named Thalath akhwat (three sisters). To the westward, hardly visible, are the ruins of Aroer[3] (ruins = Iyim :[4] Ije-Abarim = the ruins on the other side), and " that town in the wadi." They are on the old main road to the north where it crosses the Wadi Arnon.

All this time we have been flying up the eastern edge of Moab[5] (with my father, *i.e.*, Lot), and we now pass on to the country that, at the time of the Israelites, Sihon[6] (Striker-down), King of the Amorites (Highlanders), had just captured from the Moabites. Soon we pass the Omayad Khan (inn) on the main east and west camel road, and shortly afterwards we fly over the Haj Kalaat of Debaa (دبح = killing), which must be somewhere near where Sihon was defeated.

Here the country changes. Since we turned to the north we have been flying over rolling country, not unlike the Salisbury Downs, but in front is a large, open, flat grazing plain, bounded on the south by the Wadi Zerka-Maiïn, on the west by Abarim[7] (the hills on the other side, *i.e.*, Transjordan), on the north by the hills that end at Heshbon (place of reckoning), whilst to the east the grazing ground stretches away as far as one can see, broken only by ridges of low, rounded hills, so low that armoured cars can travel over them practically as they wish. At the proper time of the year, the whole country is full of grazing camels and goats. This is Kedemoth[8] (the eastern districts), or the Pisgah Plateau, and over this ground travel all raids against Amman. The Israelites, Lawrence, and the Wahabi raid of 1924 are instances of some of them. It is worthy of notice that none of these raids reached Amman. That town is apparently always captured from the west.

The air-mail route takes the course from Gaza to Ziza, and machines on this course fly across the Wadi Zerka-Maiïn. Whilst still over the Dead Sea, looking towards the mouth of the wadi, it can be seen that there was once a small volcano a short distance up the wadi. The basalt has flowed out of the wadi into the Dead Sea. At the top of the flow are ruins known as Herod's Baths (Callirhoë), whilst at the

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[1] Num. xxi. 18. [2] Num. xxi. 16. [3] Josh. xii. 2; Josh. xiii. 9, 16. [4] Num. xxxiii. 44. [5] Gen. xix. 31. [6] Josh. xii. 2; Deut. ii. 26. [7] Num. xxxiii. 47. [8] Num. xxi. 20; Deut. ii. 26.

bottom on the edge of the sea there are hot and cold and sulphur springs.

All this is the country that the Israelites captured from Sihon, King of the Amorites. The railway station on the plain is Ziza, called Jazer[1] in Arabic. This word is جاهص = reward, and means, in Hebrew, whom God has helped. West of the railway there are many tels and village sites. Just north-east of the station is the ruin of Meshetta (winter sports palace), built by the Persians, its façade being now in the Berlin Museum. In the distance, to the east, Kasr Kharaneh, at landing ground "B" on the Baghdad track, can just be distinguished. Built into its gate are Greek and Latin inscribed stones; and the fort was used at least till A.D. 1400. Farther to the south-east, on one of the roads to Kasr Tuba, can just be distinguished Kasr Hammam (the castle of doves). Immediately to the north are the low hills round Amman, which rise to Gilead (rugged hills); and in the far distance are the hills of the Jebel Druse, in which Salkhad[2] (Salcah = the road) on the borders of Bashan[3] (fertile country) is situated.

Returning now to Akaba, the writer will endeavour to describe the route of the long reconnaissance eastwards. The terrain is not as good as on the other route, so we must wait, like the Israelites, for the clouds to lift[4] before we attempt to fly over the mountains. As it is a bad climbing day, we will fly up the Wadi Ithm, trusting that the new road will be sufficiently straight if we have to make a forced landing. We pass over the dam, and a little farther on we note the stone inscribed in beautifully written old Arabic which has since been made indecipherable by Arab wasms (tribal marks). At the fork of the wadi just in front there is a square Roman fort, which guarded the junction of the ways. One road goes to Rum, the country of the Romans or strangers, the other goes north to El Guweira and forms the main Akaba-Amman road. The old Roman road has recently been repaired. There are two square Roman forts and some milestones to be seen before reaching El Guweira, whilst at El Guweira there is an ancient post and a square watch-tower on top of the hill behind the post.

The narrows of the Wadi Ithm suddenly open out before we reach El Guweira, and we come abruptly to the red sandstone country[5] (Zered = زرد = red). At some time the granites of Akaba have pushed up to a height greater than that of the limestone country to the north, leaving, over a considerable area, a very thin layer of limestone over the red Nubian sandstone. For a distance of some miles, the limestone has eroded away, leaving the sandstone, which is coloured predominantly blood-red[6] (Edom = Ed Dum = دم = blood). The

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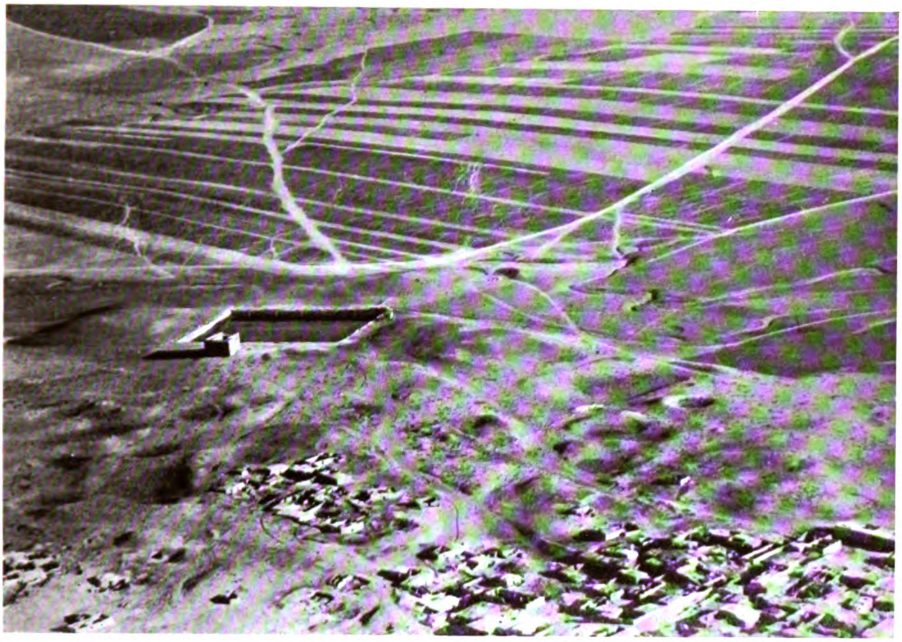
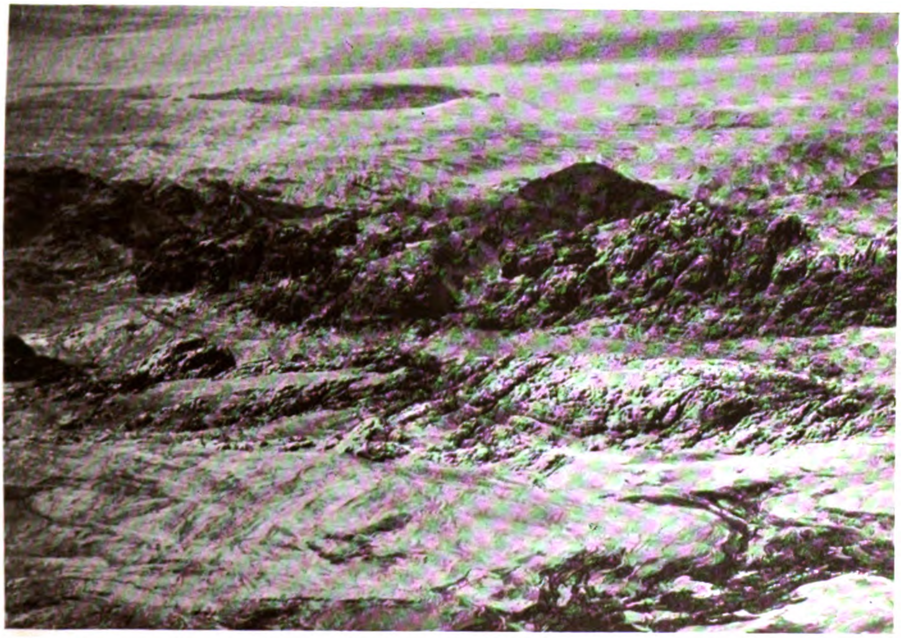
[1] Num. xxi. 24, 32. [2] Deut. iii. 10. [3] Num. xxi. 33. [4] Num. x. 11; Num. ix. 17. [5] Deut. ii. 14; Num. xxi. 12. [6] Gen. xxxvi. 8, 19.



[R.A.F. Official : Crown Copyright Reserved.

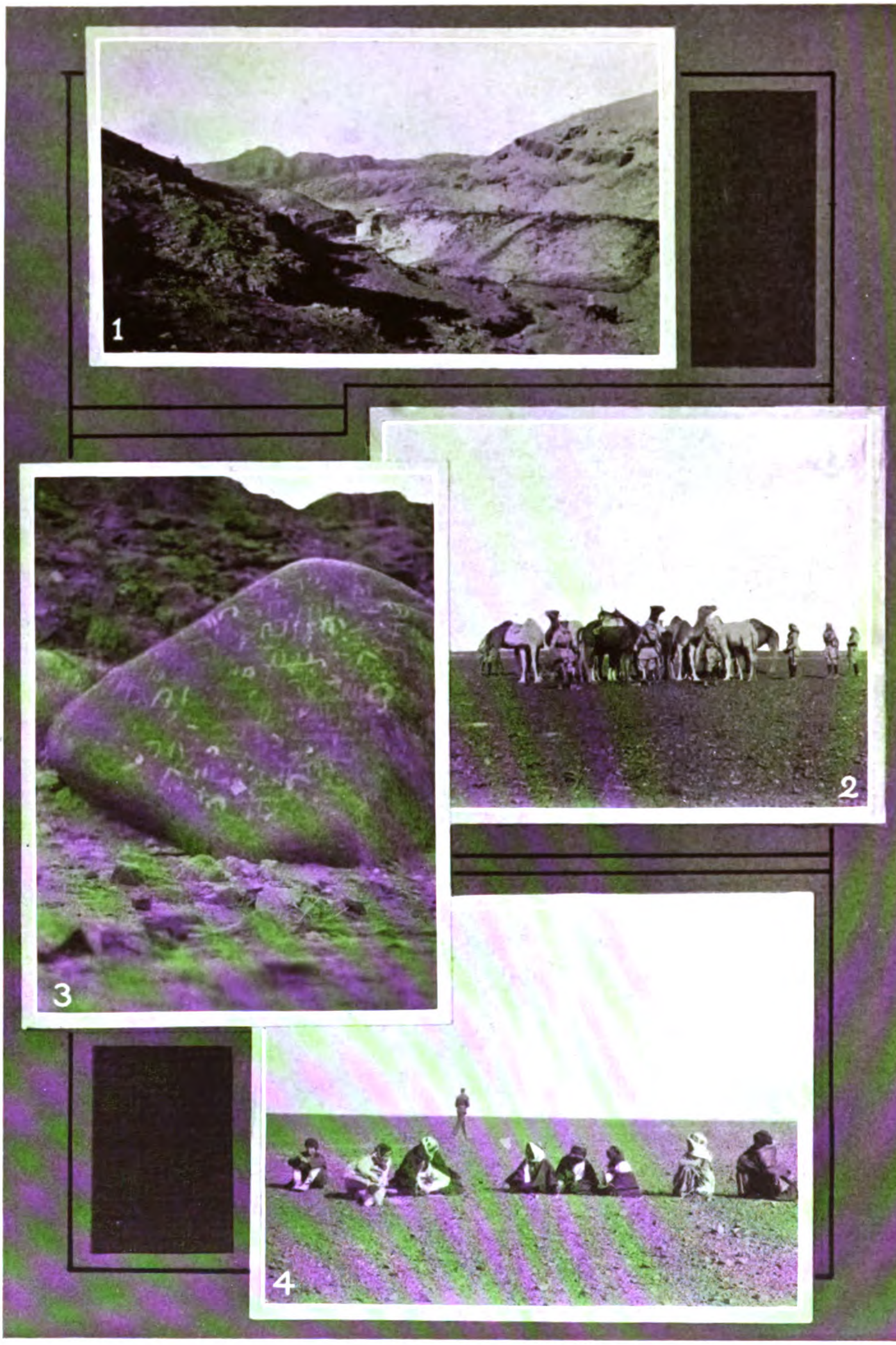
Ziza (Jazer) the frontier of the Ammonites and the commencement of Kedemoth, the eastern districts.

The tank and fort are one of the stages on the Haj route to Mecca.



Petra. Showing how "Halak, the bald country, rises to Seir, the rough country."

The black ridge in centre of picture is some 5,000 feet above the Araba beyond and 3,000 feet above Petra on the near side. Jebal Harun is just off picture to left. The small black square slightly right of centre of picture is "Kasr el Bint," the Roman temple in middle of Petra.



1. Petra from below village of Elji, showing Halak and Seir.
2. Loot recovered by R.A.F. and Transjordan Frontier Force. Note level nature of the Desert.
3. Stone in Wadi Ithm, showing Arab inscription obliterated by "wasms" (tribal marks).
4. In the Desert. The Amir Sharker, the Assistant British Resident, Transjordan, and the Amir's entourage.

sandstone in turn has been worn away by the winds and torrents in a most wonderful manner, forming a country that can be compared with the Grand Canyon of Colorado on about one-third the scale. The rough (Seir = rough), jagged[1] (Sinai = jagged) sandstone mountains, capped with a strata of a much deeper red colour, stand singly or in groups among wadis and mud-flats, which have been tinged to a pink or orange by washings from the limestone. The method of erosion is very clearly seen at the eastern entrance to Petra. Here, as soon as the first monument becomes visible, the eye is caught by a hill capped with a bald[2] (Halak = bald), white limestone or sandstone top, whilst beyond is the marvellous jagged skyline, dominated by Jebel Harun[3] (Aaron = the mountaineer) on which can still be seen Aaron's tomb. This white hill might easily be Halak, and the hills beyond Sinai or Seir.

There is no object in continuing the reconnaissance northward, because the country is well inhabited and is quiet. The present-day inhabitants of the Wadi Musa (Moses) have learnt that it is better to get money from travellers by legitimate means rather than by raiding, a lesson that the Nabataean inhabitants of the same country learned some two thousand years ago. We therefore fly eastward to Mudawara and the Jebels Tubaik and Hausa. There are a number of water-holes and there is a continual traffic all over this country. As far as Mudawara, the country is broken, then follows a large, open wadi, and beyond are the extraordinary Jebels (mountain groups) of Tubaik and Hausa.

To the east of Mudawara the country is full of small stone circles, some very old. Many are near pools that collect rain water in the winter, and many are on the sides of the wadis. There are flints near most, if not all, of them. These circles are different from those seen in the North of Transjordan, being usually smaller and more thickly built. Tucked away in one of the wadis in Jebel Tubaik can be found a site of old walls, and there is a circular fort, about twenty paces in diameter, on the edge of a small mud-flat that is surrounded by hundreds of flints. The flakes are quite different from those found in the North of Transjordan.

All this country produces a small bush, whose flower ripens into a pod containing a lot of small red seeds. The bush is only some nine inches high, and by the Arabs it is called Manna[4] (What is this?). The Arabs can live on the seeds, which, when dry, are nothing like pearls,[5] corriander, nor frost.[6]. The seeds are, however, ground[7] and made into cakes. If the cakes were made with "Sirhan" water, the dough would stink[8] in a day or two. The special feature of the country

[1] Ex. xix. 2. [2] Josh. xi. 16; Josh. xii. 7; "Petra," by Sir A. Kennedy, p. 72.
[3] Num. xx. 22. [4] Ex. xvi. 15. [5] Num. xi. 7. [6] Ex. xvi. 14. [7] Num. xi. 8. [8] Ex. xvi. 20.

is the number of small threshing floors. Some are very old and disused, whilst some are still used for the original purpose. The floors are only some two paces in diameter, but a very few are edged with stones. The floors are not placed in any relation to special features of the ground, but they cover the whole country. No single floor of this type is to be found to the north after passing the Negb that marks off the sandstone from the limestone country.

Jebel Tubaik is just as wonderful and as unexpected as the remainder of this country. The top layer of sandstone was harder than the remainder, so that the top level of the jebel is much the same all over. However, in places, it has given way, and in these places the winter torrents have eroded deep vertical-sided valleys, the sides sometimes being two or three hundred feet in height. Flying over the jebel and looking to the south, one sees a sandy plain stretching away into the distance, broken by little jagged ridges, the whole being of a vivid red colour. Except for the colour, it looks like a beach—say the Eastbourne beach—when the tide is out.

Over this country, when the rains commence, quite small rain-clouds drift, one after the other. It is quite easy to fly round them, and they are full of jagged lightning and thunder. They are exactly like the conventional drawing of a nimbus. If the clouds miss any area, the Bedouin have to move to new waterings, and from the air one will notice small boys in charge of a few goats acting as an advanced party to the main tribe. If one is lucky enough to fly behind one of these clouds before the water has sunk into the ground or dried up, one can see, on occasion, remains that are quite invisible in normally wet or dry weather. On one very bad day the writer saw the plan of a Roman camp on the edge of the Wadi Ghara, near the Wadi Sirhan. On returning on a good day, the camp was quite invisible, both from the air and from the armoured cars.

Continuing the reconnaissance, we now turn north-westward and cross the Negb from the sand on to the limestone country. This country is covered with a layer of flints on what, in a damper climate, would cake into clay, but which at present looks like sand. When one is flying, the country looks yellow in front of the aeroplane and black behind it, or *vice versa*. In the rains, a barley grass grows in small patches, and one comes across numbers of small purple iris; whilst the wadis are full of camel food, which contains so much water that a camel can go for many weeks without having a long drink.

Soon we come to Bair Wells,[1] where there is a ruined Omayad fort and a birket (tank). This birket differs from others, because a well has been dug just outside the middle of one side, and the well is connected with the birket by a channel that enters it right in the middle of that

[1] Num. xxi. 16.

side, about half-way up the wall. Round the birket are traces of irrigation channels that distributed their water to the gardens. For some distance northward along the side of the wadi, and also farther on where the wadi turns eastward, there has at some time been a large settlement. The signs are visible only after the correct amount of rain, and are quite invisible at other times, either from the air or from the ground.

The Amir Sharker says that the word "bair[1]" has no reference to the word "bir," meaning well, but means "unreliable man"; and the author likes to think that this refers to Moses, who again, the Israelites said, had brought them into the desert to die. Before reaching Mont Hor, the Israelites had already named one camp Bene-Jaakan or Jaakan,[2] meaning The Twister, which is much the same as Unreliable Man. There are only two places in this part of the country where properly lined wells have been dug—here and at Kasr Tuba to the north-west. At Bair the wells are about 30 feet deep, and always contain water, whilst at Kasr Tuba the wells are 120 feet deep and apparently never contain water.

Through Bair runs the main camel road from Aroer, Katrani, and other large towns to the Wadi Sirhan, where, near the Wadi Ghara, there was a Roman camp. At various other places along this road there are the remains of guard-houses bearing, even now, drawings and writings in Safaitic script.

Continuing the journey, we pass over ten miles of very broken country on the east of Jebel el Hadi (هادي = one who gives a present) (one of the tributaries of the Arnon rises in the west of this jebel[3]), till reaching the hills of the Three Sisters (Thlath akhwat). This country might easily be Mattanah,[4] or Waheb[5] (وهب), both of which words mean a gift (or give). The writer selected this part of the country on one very frosty night as affording the best camping ground in the vicinity.

The next feature is the Wadi Ghadaf, a large wadi with shade, and, in the rains, plenty of grazing. We pass over the Omayad building of Kasr Tuba, and notice the wells. For the greater part of the year, there is water in the wadi, and opposite the Kasr there is a good landing ground. This wadi might be Nahaliel[6] (God's wadi).

Keeping slightly to the north along the armoured-car track, we fly over flat ground till the type of country changes as we get back on to the comparatively high limestone country east of Ziza. From the armoured cars this country looks mountainous, and there are cairns on many of the hill-tops, most of which produce flints. This country might be Bamoth[7] (High Places). As we continue to follow the road,

[1] Num. xxi. 16. [2] Num. xxxiii. 41. [3] Num. xxi. 15. [4] Num. xxi. 19. [5] Num. xxi. 15. [6] Num. xxi. 19. [7] Num. xxi. 20.

the country narrows in, and suddenly we come to a wadi[1] that is quite unique. It is just over the watershed that divides Ziza Plain from the wadis that flow eastward, and is thus at the eastern end of Kedemoth, the plain that stretches to the east from Ziza. In this wadi are the Tuba wells, as they are wrongly called by us. They consist of a hollow about thirty feet deep suddenly worn in the flat, open bed of the wadi. The pools usually contain water, and there is an Omayad dam across the wadi. The tank behind the dam is now completely silted up. In 1928, the pools dried up, and, incidentally, in the same year, the quails were blown out to sea and failed to land in Palestine in any numbers. A season of this kind would have forced the Israelites to commence a march. When we cross the watershed either directly or by way of Kasr Hammam, we arrive back at Ziza aerodrome, the main Amman-Baghdad track being visible just to the north of us.

Having described the country, the writer will give a precis of Lawrence's raid, followed by his interpretation of the route of the Israelites through Transjordan. In each case, the problem was the same. Both raids (or at least the leaders) left the vicinity of Cairo in an endeavour to reach Jerusalem, the Negb and the country of Moab being in the hands of the enemy. The routes of the two raids become the same after reaching Akaba. The modern raid is used to illustrate the ancient one, which is not so clearly described.

Lawrence left Cairo, went to Wejh and then on to Akaba by way of the Wadi Sirhan. He arrived at Akaba some two months[2] after the commencement of his journey, having encountered, in the Wadi Sirhan, a plague of snakes[3] and water that stank[4] if kept more than a day or two. The old wells had to be reopened, and those not digging sang to the workers.[5] Singing at work is a feature of the country.

From Akaba raids were organized. The first march reached only the Shade in the Wadi Ithm,[6] because the machine gunners were not yet acclimatized to the heat of Akaba. After that, the red country was crossed. The hill, called el Hamra (red), is especially mentioned as a good camping ground.[7] It was impossible for the early raids to go directly north, because the country near Petra was held in too great strength by the enemy; so the route to the east was chosen. Keeping well to the east of the railway, the first raid made for Deraa[8] (Edrei = strong place) and the fertile country round it (Bashan).

This raid was not very successful, and the next attempt was made into Moab to Tafileh[9]: but bad weather made it necessary to send the camels down into the Ghor at the south end of the Dead Sea. In an endeavour to return to Akaba, Lawrence lost his way in the low clouds[10] that covered the country, and was forced to wait till they lifted before continuing his journey.

[1] Num. xxi. 20. [2] 161. [3] 131. [4] 121. [5] 143. [6] 182. [7] 183. [8] 214. [9] 207. [10] 284.

After raiding again to the eastward, this time successfully, an attempt was made towards Amman.[1] The route was by way of the Shade in the Wadi Ithm, el Hamra (red), Jefer (where the wells had been dug whilst they sang), Bair (unreliable man), el Hadi (good grazing; a gift), Ghadaf (wonderfully pretty; God's wadi), to Muaggar (place of battles). The raid had to turn back from Muaggar, which was once a Roman fort and granary, because they saw the Turks in force in the villages just north of Ziza (reward). By making a fresh attack to the north, Deraa[2] (Edrei = strong place) was taken, and the whole of the fertile country (Bashan) as far as Damascus fell into the hands of the Arabs.

Notice how the direct route was blocked, and how far out into the "desert" it was necessary for the raids to go before they were able to turn effectively northwards. The Israelites had to do exactly the same.

The Israelitish story commences when Moses saw the Burning Bush,[3] and it must have been when he was at or near the volcano north of Ma'an. Whatever he saw must have consisted of smoke, flame, and some extraordinary noise which was probably the rumbling of the earth. One need not search far to find modern records of gods in volcanic mountains, and the rumblings could quite easily be taken as the word of God (John xii, 29). The people standing by said that it thundered. Throughout the whole story God only appears when Moses was near a volcano,[4] and this is very significant.[5] At other times, an angel led the Israelites.[6] The writer thinks that the angel was in the small rain-clouds. An angel is less than God, and the rain-clouds contain fire and rumblings, but do not contain smoke, neither do they normally kill people. It was here at the Burning Bush that Moses was given the promise that he and the Israelites should worship God on that very mountain.[7] The only mountain in the vicinity which has a volcano near its top is this one north of Ma'an. It is called Horeb (dry), and it is interesting to note that Oboth (bottles, or place of worship) is somewhere near.

Although the Israelites left the vicinity of Cairo in quite a leisurely manner, they probably started to hurry when the Egyptian forces commenced to follow them. They had leave to go and worship God, and they were probably making for the volcano, where Moses had been given the promise. If a line is drawn on the map from near Cairo to the volcano it passes between the Gulf and the Bitter Lakes, where are found all the conditions that could produce a Reed Sea. Being pressed by the Egyptians they had to cross the Reed Sea in the night, and hit off the crossing by marching directly on the volcano. The Egyptians, not following directly behind, partly because the chariots

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[1] 340. [2] 350. [3] Ex. iii. 2. [4] Ex. xix. 18, 12; Num. xxxiii, 47.
[5] Ex. xix. 3; Ex. xxiv. 10; Deut. xxxi. 15. [6] Ex. xxxiii, 2, 3*b*. [7] Ex. iii. 12.

had of necessity to keep to the road, and partly because they were not sure exactly which way the Israelites were moving, missed the way in the night.[1] They took the wrong passage and were engulfed. The writer failed to make a certain camp at night because of ponds and precipices, but saw in the morning that he was on practically a level plain, and could not find enough water for breakfast.

The only time the cloud appeared behind the Israelites was when Moses expressly directed them to turn round and look at the Egyptians so as to see what God would do to them.[2] It was only the angel,[3] as narrated in a different text, that stood between the two forces; and, as the angel is always associated with rain-clouds, it is certain that mist contributed to the overthrow of the Egyptians. If the fire had been between the two forces each would have had an equal chance, but it happened that the Israelites had the advantage, because they had the landmark to march on, which was invisible to the Egyptians or about which they did not know.

After crossing the Reed Sea, the Israelites had the choice of two roads to miss the hills at the north of what we now call the Sinai Peninsula. They chose the northern route, through the Desert of Shur[4] (wall or fortification), but could not go along the usual track near the coast of Palestine because it was guarded and they therefore took a short cut with the usual consequences. If they had been possessed of air reconnaissance they would at once have seen that this short cut was not suitable, because of the loose sand. In their ignorance they made the attempt and camped at Bitter Water[5] (Marah), and had to return by way of The Trees[6] (Elim) to the Reed Sea; and commence the march again by way of the Marshy Desert (Sin).[7]

In about two months,[8] the same time as Lawrence, they camped in the " desert " of Sinai (Jagged). This must have been somewhere west of the Petra and Tafileh group of mountains, and in the Ghor, or Araba. Anyhow, it was below a volcano that was then in eruption. The top of the mountain looked like flames coming out of a kiln,[9] and if anybody came near the mountain, stones fell on him and he was killed.[10] The camp could not be placed too near; but the Dwelling, placed at a distance from the camp,[11] was erected over one of the lower blowholes, and this prevented Moses entering the Tent when the volcano was active.[12]

One day, seventy of the sheikhs went up near the volcano,[13], and, whilst Moses drew near to the fire, the sheikhs, who probably stood a little to the north on another peak of the hill, saw God as through a pavement of sapphire.[14] God was probably manifested as a column of

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[1] Ex. xiv. 20. [2] Ex. xiv. 13. [3] Ex. xiv. 19. [4] Ex. xv. 22. [5] Ex. xv. 23. [6] Ex. xv. 27. [7] Ex. xvi. 1. [8] Ex. xvi. 1. [9] Ex. xix. 18; Ex. xxiv. 17. [10] Ex. xix. 12. [11] Ex. xxxiii. 7. [12] Ex. xl. 35. [13] Ex. xxiv. 1. [14] Ex. xxiv. 10.

fire and smoke seen against the background of the waters of the Gulf of Akaba, or against the evening sky. The Israelites were already familiar with the Goddess Het-Hor, the Mother of Turquoise, and the association of God and a precious blue stone was nothing new to them. Moses, standing under the lee of the eruption, had to cover his face as the fire blew over him, and uncovered in time to see the smoke only, which he represented as the back of God.[1] The prevailing wind is from the south-west, but at certain times of the year, especially at the commencement of the rains, the direction changes without warning, and sudden strong winds blow from the north-east. The conditions of this story indicate the approach of the rains, and the story is continued quite naturally.

Some time after seeing God, Moses was told that God in person would no longer lead the Israelites in case he killed them. An angel would be sent to lead them in the future.[2] The Israelites therefore followed the rain-clouds from grazing to grazing, just as the Arabs do at the present day. They could only make short marches, because of the flocks of small animals, and the absence of camels. During their wanderings, they encountered a plague of serpents[3] and stinking food.[4]

After a long journeying, the Israelites again reached the Akaba district, and wanted to pass through Edom (the blood-red country). At the first request, the Edomites refused, and in fact sent out a strong force to beat off the Israelites; but when they found that the Israelites had managed to move northwards on both sides of Edom, the Petra group of mountains, they found that they had little choice but to sell them food and water.

A comparatively small part of the Israelites now advanced north by a route that was close by, or even through, Moab; but the remainder had to go much farther out towards the east. Following the present-day custom, they would have reached the Wadi Sirhan.

The smaller part[5] left Akaba and camped in the Shade (Zalmonah), which might be the Wadi Ithm (dark) or one of the wadis running into Petra. At the ore-pits (Punon = Fenan) they crossed the col on to the plateau and reached the place called Bottles (Oboth). This camp was near the Hejaz Railway, not far from the stations of Jerf el Derwish, or El Hesa. Here they were on the main road to the north which they followed to Ije-Abarim (the ruins on the other side), which seems to be the same as Iye (ruins). This double name is probably Aroer (ruins) and "that town in the wadi" which can be seen from the air exactly as described. After that they camped on Ziza Plain near Mount Nebo (Prophet), near which they erected the Dwelling.

The larger part[6] advanced by the Red Wadi (Zered = el Hamra),

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[1] Ex. xxxiii. 22. [2] Ex. xxxiii. 2, 3*b*. [3] Num. xxi. 6. [4] Ex. xvi. 20.
[5] Num. xxi. 11; Num. xxxiii. 41. [6] Num. xxi. 12; Num. xxi. 19.

which is the el Guweira country, and they must then of necessity have turned eastwards. They probably stayed for some time in the wadi, where the threshing floors are now to be found, and if they did so they must have eaten Manna. When they decided to turn towards the road to Palestine, they marched towards the north-west and crossed the headwaters of the Arnon that rises in el Hadi (the gift) near Bair Wells. They swept across the Gift (Waheb). The song equally well describes this part of the country or where the westerly party marched. It probably refers to the Ziza (reward) Plain. It is a fine sight to see either camels or armoured cars sweep over this plain. Apparently they could not find sufficient water and had to turn again to the wells of the Unreliable Man (Bair). Here they dug and sang their song to the wells. These wells must have produced water vastly superior to what they had been used to for some time, and it is to be expected that here they would sing at their work.

If they followed present-day custom, they stayed for some length of time at Bair, and presently moved out and encamped at the Gift (Mattanah). Probably for the second time they moved to the good grazing ground round el Hadi (gift) and Thlath Akhwat (three sisters). Following the rains that normally commence in the east and move westward, they pushed on to God's Wadi (Nahaliel-Ghadaf), the High Places (Bamoth), and then to The Wadi (Tuba Wells).

From The Wadi[1] they sent a message to Sihon to ask if they could traverse his country, and, as soon as they received an answer in the negative, they tried to force a passage. Sihon came out to meet them, but was probably attacked in front and rear by the two parties of the Israelites and was defeated. [It may have been near Debaa (the killing) station on the Hejaz Railway.]

Having captured the country, they consolidated the position, built sheep-pens and gated villages,[2] and, having made themselves secure, they swept northwards and captured the Strong Place (Deraa-Edrei) and all the fertile country[3] (Bashan) as far as The Road[4] (Salcah Salkhad). They returned again, and, having been advised by Joshua, they cut down all the trees in Gilead, and subjected the inhabitants of that country.[5] Apparently they did not capture Amman, and it is possible that they were directed to Deraa because the basalt area east of that town was still occupied by the inhabitants of the "kites," the ancient walled strong-points.

It is significant that God appeared in the Trysting Tent[6] when it was erected somewhere near Mount Nebo, because it is here that the Israelites reach a volcano for the first time after leaving Sinai. The

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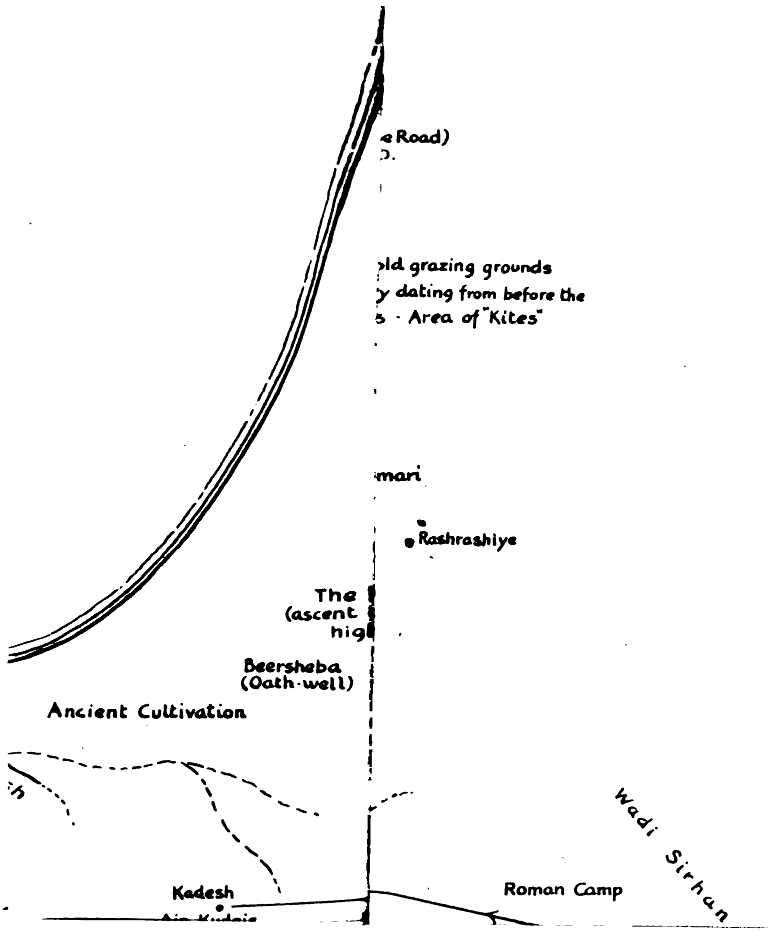
[1] Num. xxi. 21; Deut. ii. 26. [2] Num. xxxii. 16; [3] Num. xxi. 33. [4] Deut. iii. 10. [5] Josh. xvii. 18. [6] Deut. xxxi. 15.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Roman Camp
Wadi Sirhan

tent was probably erected on the site that was afterwards occupied by Herod's baths. Only the angel had been with them whilst on their long march.

From the Ziza Plain, the Israelites streamed down the wadis to Jericho along routes that have always been, and are still, used, and so reached their objective.

There are other details of the journey that all point to the route described as being the one followed. They are not mentioned, as they might confuse the narrative.

Sometimes doubt is cast on the numbers mentioned in the Old Testament. At the present day in Transjordan, any number mentioned by an Arab must be halved and have its last cypher knocked off, if it is to convey the correct meaning. If one translates the wording of the Old Testament, one must also translate the numbers according to the rule; and when this is done it is found that the numbers of the fighting men on the Exodus, which varied little during the march, amount to 30,000,[1] whilst the numbers of the Levites and the eldest males are 11,000.[2] These numbers are not excessive. In 1927, the writer saw a section of the Rualla moving west of Azrak into Syria. They filled the whole country with camels for eight days, and drank a small lake dry. On the return journey, part of this tribe passed southward through Kasr Burka (where they also drank the pool dry), and from the air the whole country for some thirty or forty miles appeared to be full of camels. Approximately 14,000 camels were counted, and there were in addition motor-cars, horses, and a number of small animals, such as goats and dogs. The number of people with this tribe might have been 4,000.

Although it has nothing special to do with the story, there is also in the desert a phenomenon worthy of mention, as it ranks with the clouds and the pillar of fire. From time to time a light appears just as though it were a signal light fired from a Very pistol. Twice this light has led the writer to the armoured-car camp for which he was making. On one of the occasions, he was temporarily quite lost, and on neither occasion was the light fired by the cars or noticed by the cars. On the third occasion the light appeared when the cars were out trying to intercept a raid; and the car crews "stood to" expecting an attack, but investigation revealed nobody.

The above shows that the story of the Exodus, even if not correctly described in detail, is more likely to be true than not; and, anyhow, that if similar circumstances arise at the present day, they would be met by action recorded in the Exodus, as is exemplified by Lawrence's raid with the Arab Army.

[1] Num. xxvi. 51. [2] Num. xxvi. 62.

EXTRACTS FROM THE OLD TESTAMENT.

Italic—Judahite narrative. *Brackets*—Northern Israel narrative.

Exodus.

iii 1. [One day as Moses was tending the flock of his father-in-law Jethro the priest of Midian (strife), he led the flock to the western side of the prairie, and reached the sacred hill of Horeb (dry).]

2. *The angel of the Eternal appeared to him in a flame of fire rising out of a thorn bush.*

5. *And He said, " Do not come close."*

12. He (God) answered, " I will be with you. And here is your proof that I myself have sent you: when you have brought the people out of Egypt, they shall worship God on this very hill."

xiii 21. *The Eternal went in front of them, in a column of cloud, to lead them by day, and in a column of fire, to lead them through the night, so that they might travel both by day and by night: the column of cloud by day and the column of fire by night never ceased to go in front of the people.*

xiv 13. *Moses said to the people, " Have no fear, stand firm and watch how the Eternal will deliver you to-day; for as surely as you see the Egyptians to-day, you shall never see them again. The Eternal will fight for you, and you have only to keep still."*

19. [Then the angel of God in front of the army of Israel moved to their rear (*the column of cloud moved from before them to behind them*), and went between the army of Egypt and the army of Israel. *When it was dark, the cloud lit up the night, so that the one army did not come near the other all night.*]

xv 22. [From the Reed Sea Moses led Israel forward into the desert of Shur (wall or fortification), and after marching for three days into the desert they found no water. When they reached Marah (bitter), they could not drink the water there, it was so marred and bitter (hence its name was "Marah"). The people grumbled against Moses. . . . He appealed to the Eternal, who showed him a tree which he threw into the water, and then the water became fresh.]

27. [They came to Elim (trees), where there were twelve springs of water and seventy palm trees.]

xvi 1. Marching from Elim, the community of the Israelites all came to the desert of Sin (marshy) between Elim and Sinai (jagged), on the fifteenth day of the second month after they left Egypt. The community of the Israelites all grumbled against Moses. . . .

4. *Then said the Eternal to Moses, " I will shower food out of the sky for you, and the people must go out and gather their daily rations every day. . . . Every sixth day they shall find that when they cook what they bring in, it is twice as much as usual."*

14. In the evening quails flew up and dropped all over the camp, and in the morning there was a fall of dew round the camp: when the dew evaporated, there, on the surface of the ground, lay thin flakes, as tiny as hoar frost! When the Israelites saw it, they said to one another, " What is it? " (" Manna ")—for they did not know what it was. " That," said Moses, " is the food the Eternal gives to you. That is what the Eternal orders each of you to gather, as much as you can eat, about seven pints a head, for every person in your households." The Israelites did so: they gathered it, some more, some less. When they had measured it in a pint measure, they found that he who had gathered much had not too much, and he who had gathered little had not too little: each man had gathered the exact quantity he required.

Moses told them that no one was to leave any of it over till next morning some did leave a little over till next morning, but it bred worms and stank . . . and whenever the sun grew hot it melted . . . to-morrow is to be a day of rest . . . so bake or boil to-day as you please, and keep what is

Exodus.

left till to-morrow morning. They kept it over, as Moses told them, till next morning, and it did not stink, it bred no worms.

" Gather it for six days, but on the seventh day, on the sabbath, there shall be none." And on the seventh day, when some of the people did go out to gather it, they found none.

The house of Israel called this food Manna (what-is): it was as white as corriander seed and tasted like wafers made with honey.

Then Moses said to Aaron, " Put seven pints of it in a jar and place it before the Eternal, to keep it for age after age."

For fifty years the Israelites ate manna, till they reached a cultivated land: they ate manna till they reached the frontier of the land of Canaan.

xvii 1. From the desert of Sin the whole community of the Israelites travelled by stages, as the Eternal bade them, and camped at Rephidim (resting-places).

2. [As there was no water to drink, the people complained to Moses. . . . " Move ahead of the people," said the Eternal. . . . " I will stand before you yonder on the rocks of Horeb, and when you strike the rocks water shall gush out, to let the people drink."]

xix 2. Leaving Rephidim, the Israelites reached the desert of Sinai, where they pitched camp in the desert: it was in the third month after leaving the land of Egypt.

3. [There Israel pitched camp in front of the mountain and Moses went up to God.]

12. *You must mark off the mountain all round and tell the people to be careful never to ascend it nor even to touch the edge of it: anyone who touches the mountain shall be put to death, not touched by any hand but either stoned or shot through.*

16. [On the third day, in the morning, there was thunder and lightning, a dense cloud of smoke on the mountain.]

18. . . . *and the mountain of Sinai (jagged) was all wrapped in smoke* . . . *the smoke rose like steam from a kiln.* . . .

xx 21. Still the people stood far back, while Moses approached the dense darkness where God was.

xxiv 1. *Moses was told to go up to the Eternal, along with Aaron (mountaineer), Nadab, Abihu, and seventy of the sheikhs of Israel; they were to worship at a distance, while Moses alone was to draw near.*

10. . . . *they saw the God of Israel, through something like a pavement of blue sapphire under his feet, clear as the sky itself.*

17. [The Eternal's radiance looked to the Israelites like blazing fire on the top of the mountain.]

xxxiii 1. [After the construction of the Dwelling and calf.] *Then the Eternal said to Moses, " March away from this spot, you and the people you have brought out of the land of Egypt. . . . I will not go with you myself . . . lest I destroy you on the road; I will send an angel in front of you."*

5. [. . . if I go with you myself for a single hour, I shall destroy you; . . . . And the Israelites stripped off their ornaments at the mountain of Horeb.]

7. [Moses used to pitch the Tent outside the camp, at some distance from it; he called it the Trysting Tent.]

9. [When he (Moses) entered the tent, the column of cloud used to come down and stand at the entrance of the tent, when the Eternal was speaking to Moses.]

21. *Then the Eternal added, " But there is a spot near me, where you may place yourself on the rocks; and when my majesty sweeps by, I will put you in a cleft of the rock, covering you with my hand till I sweep past you; then I will remove my hand, to let you see my back."*

xl 17. On the first day of the first month, in the second year, the Dwelling was erected.

Exodus.

xl 34. Then the cloud covered the Trysting tent, and the radiant majesty of the Eternal filled the Dwelling: Moses could not enter the Trysting tent because of the cloud that hung over it, and the radiance of the Eternal filled the Dwelling. Whenever the cloud was raised from the Dwelling, the Israelites used to march ahead on their route; but if the cloud did not lift, they never moved till the day it did lift. The cloud of the Eternal rested on the Dwelling by day, and there was fire in the cloud at night, as all the house of Israel saw, along their route.

Numbers.

i 1. On the first day of the second month in the second year after they had left the land of Egypt, the Eternal spoke to Moses in the desert of Sinai (jagged), within the Trysting tent, bidding him and Aaron count up the total numbers of the community of Israel.

46. The total number of the Israelites, family by family, over twenty years, who were able for active service, the total number was 603,550.

iii 39. The total number of Levites counted by Moses at the bidding of the Eternal, clan by clan, all males over a month old, amounted to 22,000.

43. . . . and all the eldest males over a month old, counted one by one, amounted to 22,273

xi 1. In the first month of the second year, after leaving Egypt, the Eternal (spoke) to Moses in the desert of Sinai.

15. Now on the day when the Dwelling was erected, the cloud covered the Dwelling, that is the tent of the Presence, while in the evening something like shining fire hung over the Dwelling until the morning. . . . Whenever the cloud rose above the Dwelling, then the Israelites moved forward. . . . Any day that the cloud remained over the Dwelling, they remained in camp; even when the cloud stayed over the Dwelling for a number of days. . . . Sometimes the cloud would remain for a day and a night, sometimes for two days or for a month or longer.

x 11. On the twentieth day of the second month of the second year, the cloud rose from above the Dwelling of the Presence, and the Israelites set out from the desert of Sinai, marching stage by stage, till the cloud settled down in the desert of Paran.

29. *We are starting for the country which the Eternal has promised to us.*

33. *They marched from the mountain of the Eternal for three days, and the ark with the Eternal's compact went in front of them all the time, to find out where they were to camp;* whenever they started from the camp the cloud of the Eternal was over them all day.

xi 1. [. . . and when the Eternal heard it, his anger blazed up, his fire burned amongst them, raging on the outskirts of the camp. So the people cried to Moses, who prayed to the Eternal, and the fire abated. Hence the spot was called Taberah (burning), because the fire of the Eternal had burned among them.]

7. [*The manna was like grains of corriander seed, resembling pearls; the people used to wander about and gather it, grinding it between millstones or pounding it in a mortar, boiling it in a pot and making it into cakes; it tasted like a cake baked with oil. When the dew fell on the camp by night, the manna fell along with it.*]

34. *Hence they called the spot Kibroth-hattaavah (graves-of-the-greedy), since they buried there the people who had been greedy for flesh. From Kibroth-hattaavah the people marched to Hazeroth (villages) where they settled.*

xii 16. *Then the people marched from Hazeroth and encamped in the desert of Paran (abounding in caves).*

xiv 25. [(*Meantime, as the Amalekites and Caananites are living in the valleys, turn away to-morrow into the desert in the direction of the Gulf of Akaba.*)]

Numbers.

xx 1. *While the people were staying at Kadesh . . . the people quarrelled with Moses.*

11. *And lifting his hand he struck the rock with his staff, till water gushed out.*

14. [*From Kadesh Moses sent messengers to the king of Edom . . . Pray let us cross your land.*]

20. [*" No," said Edom, and sallied out to stop them with a large army in strong force. Thus Edom refused to let Israel cross his territory; and Israel had to turn aside.*]

22. From Kadesh the Israelites set out and came, the whole community of them, to mount Hor (mount). At mount Hor on the borders of Edom. . . . Aaron died there on the mountain-top.

xxi 4. Then the Israelites set out from mount Hor and passed forward to encamp at Oboth (bottles); setting out from Oboth, they encamped at Ije-Abarim (ruins in Transjordan). Then the Israelites set out and encamped on the steppes of Moab east of the Jordan opposite Jericho.

4. [*They cast back to go round the land of Edom by the Gulf of Akabah, and the people grew impatient over the route.*]

6. [*Then the Eternal sent stinging serpents among the people, that bit the people.*]

12. [*Marching forward through the desert to the east of Moab, they encamped in the wady of Zered (red): then marching forward they encamped north of the Arnon in the desert that stretches to the east of the Amorite territory for the Arnon is the northern boundary of Moab, between them and the Amorites (highlanders).*]

14. [*Hence the lines in the book of the " Battles of the Eternal "—Through Waheb (Gift) we swept, through the valleys of Arnon, o'er the slope of the valleys that stretches where Ar (city) lies, that leans over Moab's edge.*]

16. [*Then they pushed into Beer, the Beer where the Eternal said to Moses, " Gather the people and I will give them water "; and Israel sang this song—Spring up, O well— ah, sing to the well that the chieftains dug, that captains delved, wielding their wands, wielding their staves!*]

19. [*From Beer (well) they pushed on to Mattanah (gift), from Mattanah to Nahaliel (God's wadi), from Nahaliel to Bamoth (high places), and from Bamoth to the wadi in the region of Moab at the head of the Pisgah (peak) plateau that looks down upon the Jeshimon (the waste).*]

21. [*Here Israel sent messengers to Sihon (striker-down), king of the Amorites (highlanders), saying, " Let us cross your land."*]

23. [*Sihon mustered all his forces and sallied out against Israel in the desert; he reached Jahaz (trodden down) and there attacked.*]

24. [*Jazer (Ziza = reward) marking the Ammonite frontier.*]

32. [*Moses sent spies to Jazer.*]

33. Og the king of Bashan (fertile lands) sallied out against them (the Israelites), he and all his forces, to give battle at Edrei (strongly fortified). Whereupon they routed him and all his forces.

xxvi 51. [After defeating the Amorites.] The total number of the Israelites was 601,730.

62. Their (Levites) total number was 23,000, counting every male over a month old.

xxxiii 1. Here are the stages on the route followed by the Israelites—one after another:—

Leaving Pihahiroth (where the sedge grows), they marched through the sea into the desert, and after three days' march through the desert of Etham (fortifications) camped at Marah (bitter).

Leaving Marah, they reached Elim (trees) where there were twelve fountains and seventy palm trees; so they camped at Elim.

Numbers.

xxxiii Leaving Elim, they camped beside the Reed Sea.
Leaving the Reed Sea, they camped in the desert of Sin (marshy).
Leaving Sin, they camped at Rephidim (resting-places).
Leaving Rephidim, they camped in the desert of Sinai (jagged).
Leaving Sinai, they camped at Kibroth-Hattaavah (graves of the greedy).
From here they wandered.
Leaving Moseroth, they camped at Bene-jaakan (twister).
After other camps, they camped at Abronah (passage).
Leaving Abronah, they camped at Ezion-geber (giant's backbone).
Leaving Ezion-geber, they camped in the desert of Zin (dwarf-palm), that is at Kadesh (holy).
Leaving Kadesh, they camped at mount Hor (mount).
Leaving mount Hor, they camped at Zalmonah (shade).
Leaving Zalmonah, they camped at Punon (ore-pits).
Leaving Punon, they camped at Oboth (bottles) (? adore).
Leaving Oboth, they camped at Ije-abarim (ruins of Transjordan).
Leaving Iyim (ruins), they camped at Dibon-gad.
Leaving Dibon-gad, they camped at Almon-diblathaim.
Leaving Almon-diblathaim, they camped at Abarim (Transjordan) hills, east of Nebo (prophet).
Leaving Abarim hills, they camped at the steppes of Moab opposite Jericho (place of fragrance).

Deuteronomy.

i 3. It was on the first day of the eleventh month of the fortieth year that Moses spoke to the Israelites in terms of all the commands that he had received for them from the Eternal.

19. On setting out from Horeb we passed through that wide, awful desert. . . .

2. When we reached Kadesh-barnea (eleven days from Horeb by the mount Seir (rough) road. . . .

33. But, for all I said, you would not trust the Eternal your God, who had gone in front of you upon the road, by fire during the night and by a cloud during the day, to find out where you could pitch your camp, and to show you the road to take.

40. But as for you, move back into the desert in the direction of the Gulf of Akabah.

ii 1. Then after you had made that long stay of many days at Kadesh, we moved back into the desert in the direction of the gulf of Akaba, as the Eternal had told me. For many a day we marched round the highlands of Seir, till the Eternal said to me, "You have marched long enough round these highlands; turn to the north. Tell the people they are going to cross the territory of their kinsfolk, the sons of Esau, who live in Seir.

8. So we passed through our kinsfolk the sons of Esau, who live in Seir (rough), from Elath (trees) and Eziongeber (giant's backbone) on the Arabah route; we moved round in the direction of the plains of Moab.

12. Long ago also troglydites used to live in Seir, but the sons of Esau dislodged them and killed them off, taking possession of their country.

13. Up now and cross the wady of Zered (red).

14. When we crossed the wady of Zered thirty-eight years had passed since we left Kadesh-barnea.

24. Up, then, and move across the wady of Arnon (swift).

26. So I sent envoys from the desert of Kedemoth (eastern district) to Sihon king of Heshbon—Let us pass through your land . . . as we were allowed by the sons of Esau who live in Seir and the Moabites who live in Ar (city).

36. From Aroer (ruins) on the edge of the wady of Arnon and from the town that lies in the wady—right across to Gilead (rough), no town was too much for us.

Deuteronomy.

iii 1. We then moved up in the direction of Bashan (fertile country), and Og king of Bashan with all his host attacked us in battle at Edrei.

viii 14. God, who brought you out of the land of Egypt, from that slave-pen, who led you through the wide, awful desert, with its stinging serpents and scorpions and thirsty, waterless ground, who brought you water out of the flinty rock, who fed you in the desert with manna. . . .

24. You have been rebels against the Eternal ever since I knew you.

x 6. [(The Israelites marched from the wells of Benejaakan to Moserah (fetter), where Aaron died and was buried.)]

7. [(Thence they marched to Gudgodah, and from Gudgodah to Jotbathah (goodness), a district with streams of water.)]

xxiii 3. No Ammonite or Moabite shall enter the gathering of the Eternal . . . for they did not meet you with bread and water as you made your way out of Egypt.

7. An Edomite you must not detest, for he is your kinsman.

ii 6. You may buy food from them, you may buy water from them (sons of Esau who live in Seir).

xxxi 14. [*Then said the Eternal to Moses, "The day of your death is near; call Joshua and present yourselves in the Trysting tent.*]

15. [. . . *the Eternal appeared in a column of cloud which stood opposite the entrance to the tent.*]

Joshua.

v 10. When the Israelites were in camp at Gilgal, they kept the passover on the evening of the fourteenth day of the month, on the steppes of Jericho. The day after the passover they ate some of the produce of the land, unleavened cakes and roasted grain. And that very day the manna ceased, once they ate the produce of the land.

xi 16. In this way Joshua captured all that country . . . from mount Halak (bald) that rises to Seir (rough), as far as . . . the foot of mount Hermon.

xii 2. There was Sihon king of the Amorites (highlanders), who lived at Heshbon and ruled from Aroer on the edge of the wady of the Arnon and the town that lies in the wady. . . .

7. The following are the kings of the land whom Joshua and the Israelites routed west of the Jordan, from Baal-gad in the valley of Lebanon to mount Halak that rises to Seir.

xiii 9. . . . stretching from Aroer and the town in the middle of the wady. . . .

16. Their frontier ran from Aroer on the edge of the wady of the Arnon and the town in the middle of the wady. . . .

xvii 17. Then Joshua said to the Josephites, to Ephraim and Manasseh, "You are a great clan, so you shall have more than one part allotted to you; the hill country of Gilead shall be yours, for though it is a Forest you shall clear it and hold it to its full extent. For you shall evict the Caananites, though they do have iron chariots and though they are strong."

Judges.

xi 16. When Israel came up from Egypt, they marched through the desert of the Reed Sea and reached Kadesh. They sent messengers to the King of Edom, saying, "Pray let us pass through your country," but the king of Edom would not listen to them. They also sent to the king of Moab, but he would not consent. So Israel halted at Kadesh, and then passed through the desert, round the land of Edom and the land of Moab, keeping east of the land of Moab, till they camped north of the Arnon; they did not enter the territory of Moab, for the Arnon is the boundary of Moab.

GREECE

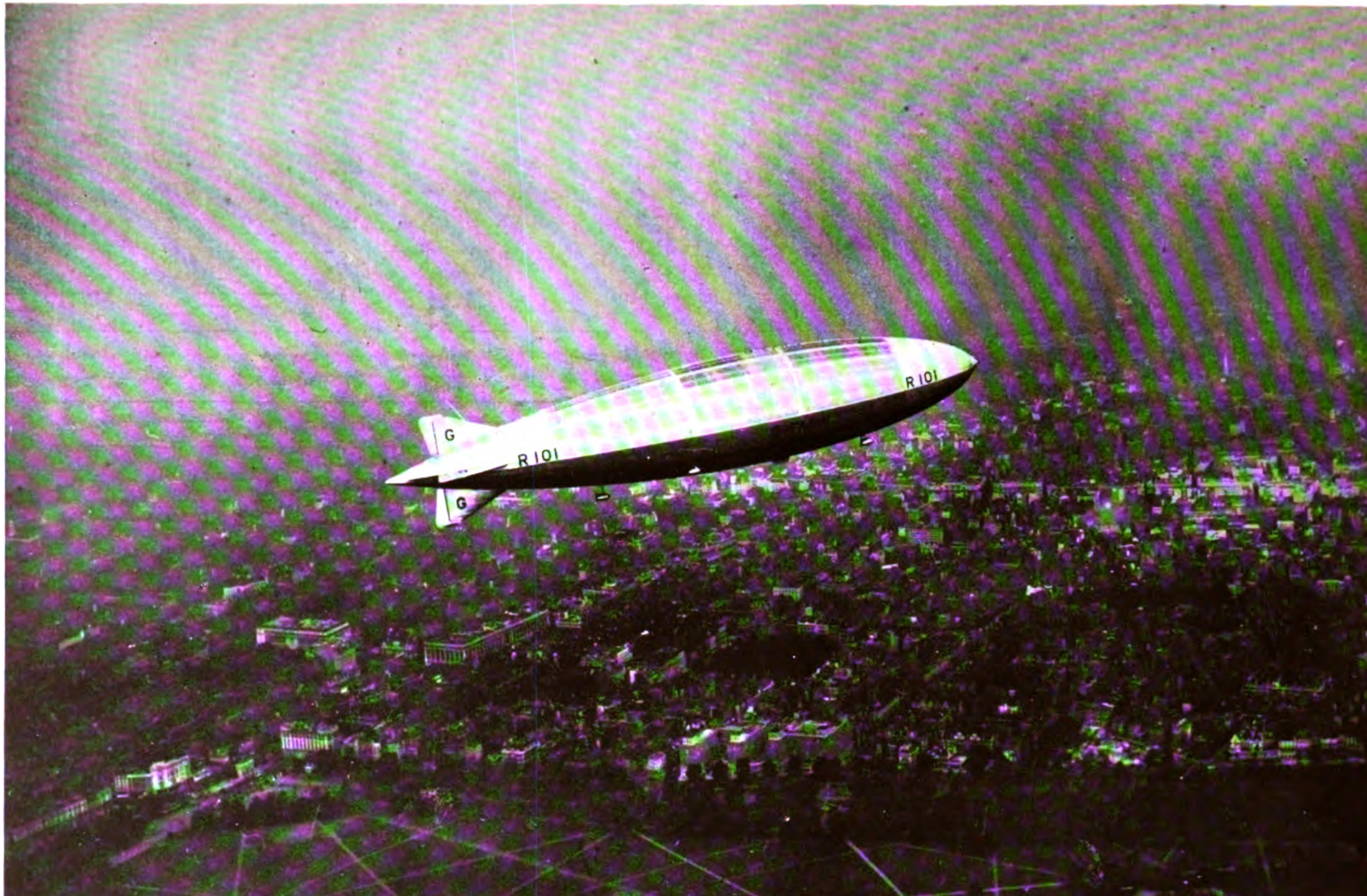
[This article will be published in two parts, the second of which is to appear in the April Number. The fact that a Royal Air Force officer is on the British Naval Mission to Greece and the fact that Imperial Airways run through Phaleron (where the Blackburn Aviation Co., Ltd., have an aircraft factory), are sufficiently important reasons for the study of Greece on the part of British aviation interests.—ED.]

I.

NOWADAYS very large numbers of people make short visits to Greece from other countries, particularly from Great Britain and from America. It is probable that the opinions they form are affected by the disbursements they have to make at Athens, and other places where visitors are a source of revenue; and, as Greece is no cheap country for a stranger, there may be many who do not speak very favourably of it. On the other hand, people who are lovers of the art and literature of ancient Greece have difficulty in believing that modern Greece can be anything but delightful.

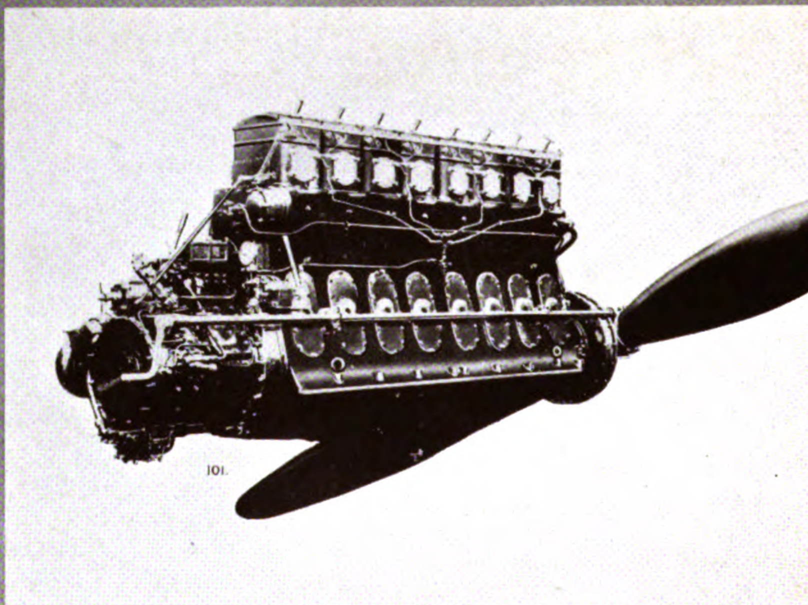
The fact is, of course, that in the Greece of to-day and in the characteristics of the present-day Greek there are many things which people of the more-developed European nations dislike. Napoleon, for instance, described the Greeks as being "False, ambitious, and proud." But he cannot have known them very well, or even in his day, when they were still ruled by the Turks, he must have been struck by their intense patriotism, which is one of their pleasantest and strongest characteristics. These characteristics, good and bad, are evident through thousands of years. And if the history of ancient, mediæval, and modern Greece is followed through the successes and the disasters which have attended this nation, it is clear that the Greek character has often brought about the disasters, which the better elements in the same character have enabled the nation to survive.

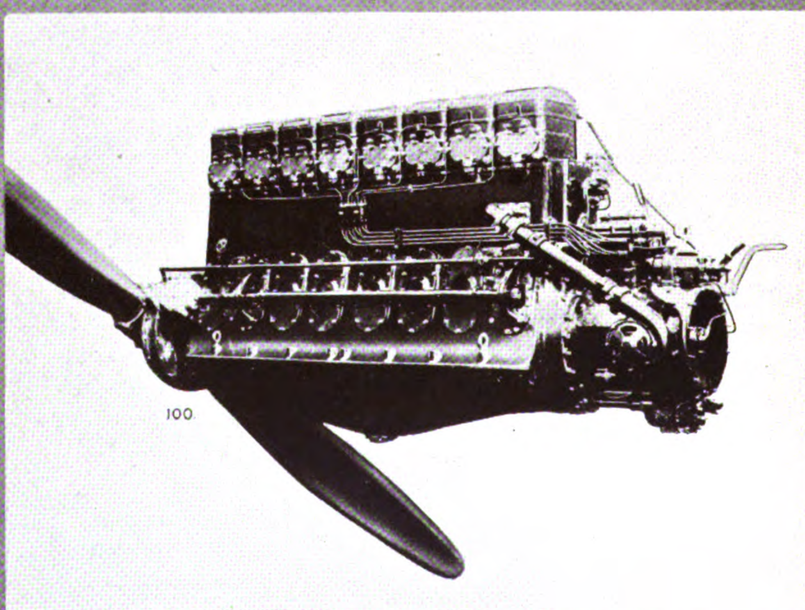
The Iliad and the Odyssey, which are probably the earliest histories of Greece, show us some of these characteristics. Even in those days they must have had a reputation for cunning. When King Priam's counsellor was asked whether he thought the famous horse of Troy should be admitted within the gates, he replied, "Trust not the Greeks, even when they bring gifts." Again, during some of the most severe fighting around Troy, Achilles—who had quarrelled with the other chiefs—remained sulking in his tent. Nowadays, it is not unfair to



[The Times Copyright.

The R101 flying over London on her maiden voyage.





585 h.p. Tornado III (Compression-Ignition Direct Drive) Engine.

say that the modern Greek is easily put out, and they certainly do not work well together.

However, leaving mythology and coming to authentic history, we learn that about 500 B.C. there were in Greece a number of towns, many in mountainous country, with the sea as almost the only means of communication. Such an environment naturally affected the inhabitants. The lack of communications made them individualistic; like all other dwellers in islands or mountainous countries, they became patriotic; and the sea bred a love of freedom and adventure. All these characteristics remain in the Greek of to-day. Climate has also had its effect; in winter it is sometimes bitterly cold, in summer it can be really hot, an azure sea which is calm at one moment is frothed by a tearing squall the next; the modern Greek is very temperamental indeed.

These early Greeks, on their islands, in their walled seaports, and in their towns aloof in the mountains, overthrew Persia, which was the greatest power of those days. The first Persian attack came in 490 B.C., when they sent an army by sea across the Ægean, landed it at Marathon—some twenty miles north-east of Athens—where it was completely defeated. Undeterred, the Persians sent a second army. This time it came by land, with its left flank all the time supported by a Persian fleet in the Ægean Sea. This army crossed the Hellespont, marched westwards through Thrace and Macedonia, thence southwards into Greece. The Greeks were defeated at Thermopylæ, and the Persian army approached Athens.

There must have been consternation in Athens. Should they make another stand against the invader, or evacuate Athens and flee to one of the neighbouring islands? Torn by indecision, the leaders consulted the oracle at Delphi. The oracle gave a reply which, for its ambiguity, reminds one of the "formulæ" sometimes produced by statesmen of the twentieth century. What the oracle said was, "Take refuge behind your wooden walls"; and from this advice two very different possible courses of action could be evolved. Some of the Greeks, thinking that they were being advised to retire behind a wooden stockade built round the top of the Acropolis, endeavoured to withstand the Persian attack there. But they were defeated, and the marks of the fire kindled by the Persians when they subsequently sacked the Acropolis remain. The remaining Greeks were wiser, or perhaps more fortunate, in their interpretation. Abandoning Attica, they went to neighbouring islands, they collected a fleet, and with it defeated the Persian fleet at Salamis in the year 480 B.C. The hithero-victorious Persian army was now deprived of the support of the fleet, on which it depended. It was driven northwards out of Greece, and eventually the survivors returned to Asia along the devious route by which they had come.

There now followed what is known as the Golden Age of Greece. Not only was this very loose confederation of cities and small states the greatest naval and military power of the world, but there was also a most remarkable advance in culture. Philosophy, painting, sculpture, the drama, the theory of government were all developed; whilst architecture reached a standard which—of its kind—has never been surpassed. In this age of prosperity, the difficulty which Greeks find in working amicably together showed itself. The states began quarrelling amongst themselves. First, Athens fought its maritime rivals, Corinth and Ægina; then Sparta joined the alliance against Athens, and Athens succumbed. Next, Thebes overthrew the victorious Sparta, and finally Macedon overthrew Thebes. Under the second Macedonian ruler, Alexander the Great, ancient Greece reached her zenith, Greek power controlled most of what are now known as "the Balkans," Asia Minor, much of Egypt, with colonies on the Mediterranean shores as far west as Marseilles. Concurrently, Greek culture spread over this great area.

After the death of Alexander, Greek influence shrank. European Greece disintegrated into a number of city states, against which the rising power of Rome fought for four generations, until Rome conquered in the year 164 B.C. This Roman domination, which spread to the south and east over former Greek possessions, was a paradox. It was a domination in the military sense only. In other ways, it was a Greek domination, for the Romans, who were hitherto a crude people, adopted the culture, and often the language, of the Greeks. Consequently, Greek culture followed the Roman legions into Western Europe, just as it had followed Alexander eastwards to the Indus. And during all this, the Greeks never lost their sense of nationalism; some city in European Greece was always the spiritual home of every Greek in the colonies of Africa or Asia Minor, and it was the custom for prosperous Greeks abroad to enrich the cities at home by making gifts of buildings or works of art. We find the exact counterpart of this to-day. Practically every town, and practically every little village, benefits by the patriotism of Greeks in foreign countries. At Athens, for instance, the stadium, a fine road, and even a battleship, have been provided in this way. And a villager will often show with pride a stucco school-house; or a dusty square, which makes a pathetic effort to look like a public garden, in spite of the summer drought—the gifts of the rich man in America. It was this same patriotism which, together with the mental superiority of the Greeks, enabled them not only to survive, but even to benefit by the Roman domination.

During the reign of Constantine the Great, two events occurred, both of great importance in Greek history. In the year A.D.313, he adopted Christianity; twenty-five years later, he founded Constantinople as the

imperial capital, instead of Rome. It followed that the last of the Greek philosophers fell naturally into the rôle of powerful divines; and, as Greek influence was predominant at Constantinople, the Greeks exerted more and more power in the Imperial Government. What could have been more logical than that, as the western part of the Roman Empire crumbled under the pressure of the barbarians from the north and west, and as the Churches of the old and new capitals drifted farther and farther apart, a new empire should rise up? In this manner the Byzantine Empire was evolved. It was an empire of Greeks, with orthodoxy as its faith, and Constantinople as its capital.

Under the Byzantine Empire, which was at its zenith during the ninth century, the Greeks became for the second time the greatest people of the Western world. This empire comprised, on the west, Greece and most of the Balkans; on the east, it extended far into Asia Minor. But in due course it came to be attacked on both its flanks. The Normans, Venetians, Genoese, and—in passing—the Crusaders attacked it on the west. In fact, during the thirteenth and fourteenth centuries, much of Greece itself was under Latin barons. The style of many ruined buildings to be seen now in Greece testifies to this occupation. So do many of the place-names; Navarino, for example, was the seat of the Duc de Navarin. Simultaneously with these attacks on the west, the Byzantines were assailed by the Saracens and Turks on the east. Though the Greeks had triumphed over their eastern attackers from Persia some two thousand years previously, this time they succumbed. It was in 1071, five years after our Battle of Hastings, that the Byzantine armies in Asia Minor met with their first serious reverse. After this, the Turks pressed westwards ever more vigorously, until Constantinople fell in 1453, and, with the spread of Turkish power into Europe, Greece started upon nearly four centuries of Turkish domination.

The oppression by the Turks appears to have been indeed severe. The great majority of the Greeks remained true to their orthodox Christianity. Consequently—as infidels—they were denied almost all legal rights. Also, every four years, a fifth of the men of suitable age were deported to be turned into the Sultan's janissaries. Even commerce was made difficult for the Greeks, because the Sultan admitted to Salonica, Athens, and Patras—with preferential treatment—Jews who had been expelled from Spain. It is noteworthy, however, that even in bondage the Greeks did not lose their commercial astuteness, for only a small Jewish colony at Salonica has survived their competition.

It was really the same characteristics of superior mentality and patriotism that enabled the Greeks to survive the Turkish domination,

as it had enabled them actually to prosper by that of the Roman. We have seen that, despite the imported Jews, they retained their commerce. In addition, by reason of their mental alertness, they not infrequently held high administrative posts under the Turks, and—as emigrants—under the Czars in Russia. Neither did they allow their nationalism to be extinguished; their religion served to keep them together as a nation, and they managed to maintain a number of Greek schools. So it came about that, at the end of the Napoleonic Wars, when the states of Europe were being reshuffled, there was nationalist anti-Turk feeling in Greece fostered by several secret societies.

In April, 1821, the revolt started. At this time, the Turks had been obliged to withdraw most of their troops from Greece, to deal with Ali Pasha, the Governor of Janina—in the north—who was giving them a lot of trouble. Noting this opportunity, Germanos, the Archbishop of Patras, fastened a pale-blue and white altar-cloth to a staff, and waved—as a standard for the revolutionaries—what has become the national flag of Greece. So the revolution began. The Greeks had no plan and little leadership. There was little to choose between Greeks and Turks as regards savagery, and what has been euphemistically described as " a glorious war of independence " was not much more than a series of massacres and reprisals. By the winter, all the Turkish garrisons in the south had been exterminated except at Patras and Athens. In the north-west, a Turkish army was still operating against Ali Pasha; and another, in the north-east, had been driven into Thessaly.

Before considering what had happened at sea, it is interesting to follow the rise to power of the Greek islands. For centuries, these islanders had lived by piracy, fishing, and a little trade. These pursuits, though they had bred a fine race of seamen, had produced but little wealth until the Napoleonic Wars gave an opportunity which was literally golden. Fortunes were to be made by those who could successfully run the British blockade. The writer was told by a Greek that his great-grandfather brought grain from Odessa to Spain, for the use of Napoleon's soldiers, and was paid the equivalent weight in gold. Perhaps the story is exaggerated, but there is no doubt that by this means the fortunes of many Greek islanders were made, and the fine fortress-houses which they built with their money are nowadays the summer residences of their descendants. Thus, the beginning of the War of Independence found several of the islands—notably Spetsai, Hydra, and Psara—rich in money, and with well-equipped ships, also. They drove the Turkish fleet out of the Ægean, and up the Dardanelles, so depriving the armies of its support.

In the next year (1822), the fighting on land was generally in favour

of the Greeks. But when autumn came, rather than consolidate their successes, the Greek leaders quarrelled amongst each other. Much the same occurred in 1823. Here is evidence of that unfortunate characteristic, that Greeks have difficulty in working well together, and it was lucky for them that the stupidity of the Turks brought assistance from outside.

It must be remembered that this was a reactionary period in Europe. People were tired of revolutions and wars. Consequently, the Greeks, at the start, were regarded more as insurgents who deserved to be suppressed than as a people fighting for lawful freedom. Nevertheless, there were some men of influence, with more liberal ideas—notably, Byron in England, and Victor Hugo in France—who tried to make their countrymen view the Greek efforts more favourably. The Turks, by certain atrocities, gave these Phil-Hellenes the basis for much useful propaganda. In retaliation for Archbishop Germanos having started the revolt, they executed the Patriarch at Constantinople; and they had a wholesale massacre at the island of Chios, in return for the Greek sailor Kanaris having blown up the Turkish flagship with a fireship. In result, opinion hardened against Turkey, the Greeks were able to raise a loan in London, and in the autumn of 1823 Byron took out the first instalment of this loan, establishing himself at the strategically important town of Missolonghi.

It is regrettable to record that now that there was some money available the quarrels amongst the Greek leaders grew to civil war. We may believe that Byron, imbued with the glamour of classical Greece, suffered no little disappointment. The military situation with which he was confronted was also serious, for, whilst the Greeks had been getting funds and sympathy on their side, the Turks had procured the help of the Egptian army and fleet by offering Greece to the ruler of Egypt, who was tributary to the Turkish Sultan. Dissensions amongst the Greek naval leaders had so weakened their fleet that, in 1824, the Egyptians fought them successfully at sea. In the same year, the Egyptian army, under Ibrahim Pasha, was brought as far as Crete, and next spring it was landed in the South of Greece.

The tide now turned definitely in favour of Turkey. By the end of 1825, Ibrahim's army had overrun all the Peleponnese, except Nauplia, which was the seat of such Greek government as existed. Next year the Turks extended their success across the Gulf of Corinth; they took Missolonghi, where Byron had recently died. It is recorded that the Sultan, wearied by the hitherto-successful resistance of Missolonghi, had not exactly given his general two objectives, but had offered him two alternatives. "One of two things must fall," he had stated; "either Missolonghi or your head." The Turkish attacks now increased in vigour, until, seeing that further resistance was useless,

the Greek defenders decided on drastic measures. The able-bodied advanced by a desperate sortie, in which almost all were killed; meanwhile, the aged, the women, and the children, mustered in the powder-magazine with the priest, who, as they prayed, ignited it. In this manner did Missolonghi fall. Nowadays, a considerable ceremony takes place there each year, on the anniversary, to commemorate the defenders.

The Greeks were now faring very badly in the war. In the south, they still retained Nauplia; and in the north-east, Athens. Everywhere else the Turkish and Egyptian troops were in control, the Turco-Egyptian fleet was superior at sea, and in Egypt there were reserves on which to draw. But once more help came to Greece from outside. This time it was the official intervention of England, France and Russia. The pro-Greek opinion, which, it has been explained, was fostered by a few men of influence in England and France, had grown until it became the Government policy; whilst, in Russia, the Greek cause had always been favoured since both nations embraced the same religion. By the Treaty of London, therefore, in 1827, the three powers recognized Greece as an independent state, and ordered their naval commanders-in-chief in the Mediterranean to endeavour to enforce an armistice.

At about the same time, Admiral Cochrane and General Church arrived to command the Greek fleet and the Greek army, though both had come out under private agreements. Their taking over control did not, at first, have at all a happy result. Having decided that the first necessity was to relieve the Athens garrison, they brought troops from near Nauplia and landed them in Attica. Church appears to have wanted to get things in order before attacking; but Cochrane, threatening "to withdraw, ships and money, and leave Greece to perish," unless an immediate advance was made, hastened on the battle. The result was a disaster for the Greeks, in which such Englishmen as took part only regained the ships with difficulty. It seems unfortunate, when the Greek leaders were losing so much by disagreements amongst themselves, that the two Englishmen could not set a better example of co-operation. The impetuous Cochrane, for all his great gallantry and skill, was probably not the right leader for this war. Greeks will always provide enough impetuosity; they want a shrewd leader to see that it is not mis-spent.

Church now transferred such troops as he had to the north shore of the Gulf of Corinth. In this district, with another Phil-Hellene called Hastings, who commanded a flotilla, he retook Missolonghi and gradually came to control all the North of Greece. Hastings was a remarkable character. Originally in the British Navy, he had fought in the *Neptune* at Trafalgar, but in 1820 he had to leave the

Service, having challenged his flag-captain to a duel. After this he took service with the Greeks, and he executed a number of attacks on Turkish ships with so much skill and success that he gained, though on a smaller scale, a reputation for invincibility like Drake or Blake. Being a man of advanced ideas, and favouring the use of steamships, he obtained a certain amount of money and returned to England in 1824. Whilst at home, he fitted out the first steam-warship of the world, the *Karteria*. This ship he used in the Greek service very largely at his own expense, for, as he would always spend his money rather than that his men should want, the Greeks did not always see the necessity for supplying him. Moreover, in spite of all his difficulties, he maintained a well-disciplined ship and was popular.

During the operations in the Gulf of Corinth, Hastings and Church quarrelled. They were both in difficulties because money to pay their men was lacking, and, after the island of Vasilida had been captured by them in a combined operation, Hastings appears to have sent Church a bill for 2,000 dollars for " services rendered." However, they made up their differences and continued the fighting. Later on, whilst leading a landing party at Aitoliko, Hastings was mortally wounded. He died, and was buried at the island of Poros, where are situated most of the training establishments of the Greek Navy. He is undoubteldy recognized by modern Greeks as one of their naval heroes.

It has already been explained that England, France and Russia decided to enforce an armistice. Accordingly, our C.-in-C., Codrington, proceeded to Nauplia, where he met the Greek authorities, who agreed to stop fighting. At the head of the allied fleets he then arrived off Navarino on September 25th, 1827. Ibrahim Pasha had his headquarters nearby, whilst a considerable Turkish and Egyptian fleet was anchored in the large, and perfectly sheltered, harbour. The allied admirals met Ibrahim, who promised to take no action until he received further orders. So the three fleets withdrew, and Cochrane went north to the island of Zante for stores. It soon became evident that Ibrahim was not true to his word, for a number of Turkish ships were seen standing to the northward with the probable intention of entering the Gulf of Corinth to engage Hastings, who does not seem to have been observing the armistice either. Codrington forced these ships to return to Navarino, and again appeared with the allied fleets off the harbour. Next he sent in a protest to Ibrahim, only to receive the obviously false reply that he was away, and that communication with him was impossible. On October 20th, Codrington lead the allied fleets into Navarino, where they anchored to seaward of the Turkish and Egyptian ships, not with the definite idea of fighting them, but to prevent absolutely any movements. Of course, the ships were

ready for battle, the chance of an action being recognized. All the same, the battle might not have occurred had not the Turks fired on a boat sent by the Captain of the *Dartmouth* to demand that a fireship to windward of him should be shifted. On the *Dartmouth* replying with a fire to cover the return of her boat, the action became general. Before nightfall, three-quarters of the Turco-Egyptian fleet had been sunk.

Naturally, the news of this caused no little stir at home. The Government, becoming suddenly aware that a really first-class victory had been won against a country with whom we were not even at war, decided, after inquiry, that Codrington might have been less precipitate, and recalled him. Nevertheless, he received the thanks of Parliament, and he, as well as numerous of his officers, was promoted. On the other hand, when the applications for prize-money were made, the Treasury—with canny logic—replied that, as there had not been an official war, there could not possibly have been a battle, and declined to pay. Fortunately for the claimants, Codrington, who left the Navy and entered Parliament, was successful in getting a motion agreed to which reversed this decision.

As regards the Greeks and Turks, their position was one of stalemate. The Turkish troops were mostly in favourable situations, but the Battle of Navarino had finally deprived them of all support by sea, and they could not so remain. In due course, the Turks evacuated the country, which, in January, 1828, was declared an independent republic, with its northern boundary running east and west from Volo to Arta. The President was Count Capodistria, a Greek who had lived in Russia, where he had been at one time Foreign Minister to the Czar. From this date starts the story of modern Greece.

(*To be concluded.*)

PIGEON-SHOOTING IN BAGHDAD

By Jane Purves.

Ever since tiffin at noon the hot fidgetty heat of midday in July in "Mespot" had kept us prisoners in the underground *serdab* until the lower angle of the sun at four o'clock made thoughts of open-air exercise attractive.

"Bo-o-o-y! *Mai Härr.*"

"Comin', memsahib!"

A rattle of the invariable hot-water cans of Mesopotamia—empty petrol tins—told that our hot baths were well under way, and soon a bath and a change of clothing made us ready for the hot tea and toast Sharman had ready for us. As we drank, we looked up through the deep, unglazed window into the courtyard, where little twelve-year-old Khoumiss—butler's boy, cook's boy, lady's groom, bath boy, and now, to his huge delight, motor boy, to that fair lady *Khatun Tambili* ("My Miss Motor-car"), was rapturously poring over her, polishing her brights until they dazzled one. *Tambili* was a Ford of 1926, but, in spite of bumping over the virgin desert for three years, she runs as sweetly as a model newborn from the mother factory.

Khoumiss's costume was comic. An astrakhan fez with a gold-velvet top surmounted his sallow face, his little black eyes were one bright smile of happiness, his huge Arab mouth a-slit from ear to ear. His voice—but there, it is always a good thing to carry your own spares, and if ever anything should go wrong with our Klaxon his raucous voice has a range that could clear two miles ahead—easily. An old khaki tunic built for a six-footer, and sold by "Disposals" in the bazaar, hung to his knees, and the usual striped-cotton robe of the Arab completed his uniform. Except, of course, on gala days, when he slipped his bare feet into a pair of the *sahib's*

old boots, and put an enormous ruby (bazaar!) ring on either hand, with a sprig of oleander stuck coquettishly behind an ear.

Enthusiasm cannot be bought.

From the moment Khoumiss had seen *Khatun Tambili* unloaded at the Customs quay at Baghdad, he was her devoted slave. He asked nothing more of life than to wash and polish her between runs, to jump in the back, even to crawl on the luggage carrier if we had a passenger, and—oh, bliss of blisses!—to be left in solitary charge of her when we were at a dance.

We dumped game-bags into the back with him, and the *mem* guarded the two guns in front, while the *Hakim Sahib* steered her carefully over the uneven courtyard through the low archway with its heavy, studded doors of teak into the still more uneven roadway of *Tariq el Khastakhana* (Hospital Street). Threading his way carefully through the crowds of the mixed races of the Middle East, horn and brake were busy all the time.

Silk-swathed Jewesses, with the funny little metal-gauze shutters they wear across their face in deference to the custom of the country, indolent Arabs of the middle class lolling in their wooden couches at the cafés far out into the roadway—for footpath there was none—Khurdish coolies, Jew merchants and every caste of India brought over as subordinates in office and hospital, as cook, gardener or *dhobi*, black-swathed Arab women wending their unobtrusive way, every unit of the thick mass about us seemed to drift before our bonnet.

And the smells! The perfumes of Araby so sung in story are non-existent in the Middle East except the Persian essences of attar of rose, jasmin and amber, but, going down the other end of the scale, we may find every reek, stench, odour, smell, effluvium and garbage-stink under the sun!

The perpetual stoppages would have killed many a car, especially as all four wheels were probably on different levels, but *Khatun Tambili* came out of the struggle smiling and unscathed.

We turned to the left northwards along New Street, the one decent street in Baghdad, made by an impatient German general in the war. The spurt of a quick blue pencil on the map " from thar to thar! " as an old musical comedy has it, went through mosque and dwelling-place, courtyard and bazaar. No attention was paid to the wails of the dispossessed as the dwelling-places of generations were pulled about their ears. The road was made quickly and none too well, for even now one's car is liable to break through into a hidden *serdab* during the rainy season, and everyone shot out into the mud of a " Mespot " winter.

Only those who have been there know what that mud can be.

But to-day was glorious. Past five o'clock, traffic was thick as

all made their way out through their nearest gate into the crystal-clear air of the desert.

Shrill, harsh voices of the *arabanji*, or horse-cab drivers, hail each other before and after they pass. Screeches of badly applied brakes of taxi drivers torment the ear. There are over three hundred of them, all driving Ford cars, driving on tyres flat to the rim rather than bother to mend punctures, and pump. The blare of every known motor-horn or klaxon, the babel of voices, raucous as only Eastern illiterates can be, the dust and reek of the crowded street, all made one give a gasp of relief when *Khatun Tambili* sped out past the guard at the gate round to the date gardens that fringe the River Tigris for many a mile.

Being " fed to the wide " by the everlasting round of goat's flesh, buffalo meat and tasteless chicken, we hoped to get some pigeon or quail to enliven our menus for the next day or so.

The bumps on the Bund were awful. It was nothing for the off wheels to be a foot or so higher than the inner one moment, when a sudden change-over would give the others a heave up. We bounced about in our seats in a way that was good for our constitutions. No car owner in " Mespot " can possibly indulge in a " liver " : the two things are incompatible.

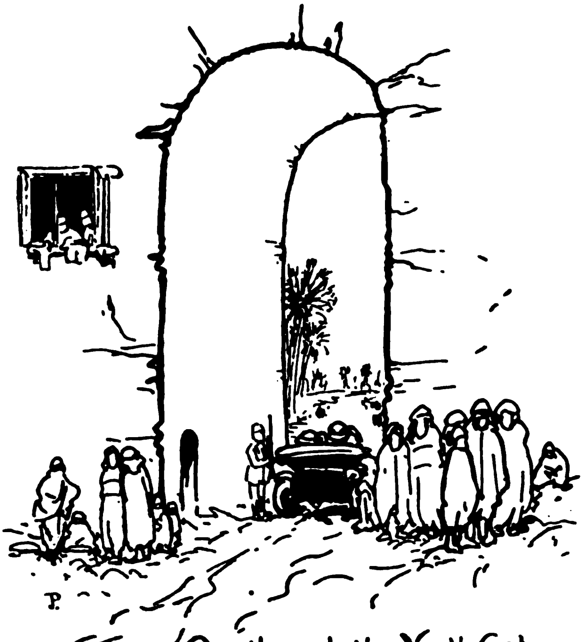
Khatun Tambili never turned a hair, and an hour's run brought us to our objective.

Leaving Khoumiss in charge, we shouldered guns and cartridge-bags, and wended our way along the narrow tracks that ran beside the irrigation ditches throughout the date gardens. Here and there a wealthy orchardist had satisfied his love of beauty by planting an untidy clump of roses. Sometimes intensive culture made them plant oranges beneath the thirty and forty-foot palms, but, except for the few wealthy people who seclude their wonderful secret orange orchards from the passer-by, dates alone were grown for miles.

The water was bubbling its way along the thirsty little canals, that precious water that almost pays its weight in silver taxes, as we took our stands. We were well out of range of each other, for sometimes I, the *memsahib*, go into a dream over the silent beauty of the grey-green palms against a sunset sky, and have been known to shoot more wildly than well as the pigeon came over to their feeding-grounds.

Sitting alone on a split palm trunk thrown across a canal, the lush green undergrowth not yet destroyed by August's blistering 126 degrees in the shade, the sweet silence about one rested nerve and spirit after the fret of midday heat.

A bul-bul, or nightingale, chirped in a bush near by, a song with one lovely note which, in spite of Omar Khayyam, is not to be compared to that ecstasy of melody the English nightingale trills out



'Out through the North Gate.

to his mate in the coppices at home, but sweet enough in a land so empty of song-birds as "Mespot."

Suddenly the popping of the *sahib's* gun well away to the right brought her gun to attention, and two out of the *mem's* five shots brought down food for the pot.

Then silence again as one waited for the next flock to drive over. The sun fell lower into the deep violet haze, the dates flung criss-cross shadows two hundred feet long, the pellucid air above was primrose, flame and chrysoprase. Suddenly a rustling in the near undergrowth, and three jackals came loping through five feet away, intent upon their own affairs. With a flick of their topaz eyes at the *mem,* they streaked away too quickly for a pot-shot at them—a duty when nine out of ten have the mange, and flocks are riddled with rabies.

Sudden distant shots told that once more the *sahib* was busy, but very few came over the *mem's* direction, and her total bag was three pigeon and a quail, unless such simple things as utter silence, beauty, colour and matchless air exhilarating as champagne be things that count.

Back to Khoumiss and the precious *Tambili,* the way led past the tiny mud-huts of the Arab cultivators. The men were squatting along the roadside after the long day's toil. *Zibâla* fires were burning everywhere, their thick acrid smoke spiralling straight upwards into the windless air. Women were busy getting the evening meal, a simple stew of onion, rice and a dollop of goat's flesh served on a round of *Khubz,* or biscuit-bread, as large as a dinner-plate.

The cultivator is a splendid worker and decent fellow on primitive lines. Many a one have I seen giving his tired wee daughter a ride home in his arms, in spite of the traditional contempt for the woman inborn in all Arabs. Their huts are miserable things of baked earth piled thick to keep out the cruel heat of July and August. During

the cool months, they grow melons and onions on their roofs. A copper jar or two for water, a wooden couch with a coarse rug for company to sit on, a rolled-up bed in a corner to sleep on, a cook-pot or two, and the Arab hut is furnished.

One thing they will have—seclusion. None may see into any of these poor dwellings except an outcast woman live there—her door pitifully free to any contemptuous passer-by. So even the poorest hut has its twelve-foot wall about it, protected by thick camel thorn atop, the entrance hung with thick *chitai*. Even the little alleyways are roofed over by every Arab with beaten petrol tins, lest "his house" be ashamed by a strange man's eye on her. Black-veiled, she walks free from all insult; bared, her face would win a ribald jest from any passer-by, for no Arab women, except the poor short-lived dwellers in the Maidan, walk unveiled about Baghdad.

Khoumiss is evidently a boy of quality. Surrounded by a ring twenty-deep of passionately interested onlookers, by some mighty mathematics of his own he had turned *Khatun Tambili* round facing home, and now sat in the driver's seat immobile, but ever watchful lest alien hands should touch beloved enamel or brass. Such is the power of personality that none dared come within six feet of his darling.

At a word from the *sahib*, he jumped out, his wide mouth agleam with greeting in the twilight. Stars were beginning to shine faintly in the deep blue and green skies of early evening—stars that would blaze out in multi-coloured glory when night fell—as we passed inside the North Gate into the flare of naphtha lights, of myriad candles and oil-lamps, of the swirling dust-clouds, noises and reek of the city's night life. The night guard passed us in with a salute, which Khoumiss gravely took and returned as to himself.

Waiting for pigeon to come over.

Cook got busy on some pigeon while we bathed and changed. Roast pigeon

with a salad of fresh young cucumbers made a welcome addition to the eternal soup, fish, rissole, goat, buffalo or chicken roast, and fruit he insisted on, hot weather or no.

But before Khoumiss touched food or coffee, every bit of *Khatun Tambili* underwent such a course of " spit and polish " that even her great designer would pass as " some shine."

RED ORMOZ

By Jane Purves.

A few years ago, pottering down the Persian Gulf in an old tramp steamer one baking hot July, a sudden frost in the atmosphere one breakfast-time surprised me. Even witty Number One, the joy of the mess, failed to lift the gloom as he gave me a solemn greeting.

At last I asked what was wrong. Apparently the stout-hearted old ship was overhauling her knots quite up to her usual form. Everything seemed peaceful, no signs of mutiny about, though the captain was on the bridge. The Chief informed me in a sepulchral voice that an earlier wireless had ordered us to call at Ormoz to take a thousand tons of red oxide aboard. In the innocence of my heart, I rejoiced aloud that we were calling at still another port new to me. Loud groans advised me to keep my rejoicings until two days after we had left the—er—condemned place.

" Why two days after ? " I queried.

" It'll tak' ye a' that tae get clean," growled Two.

A fair working philosophy of modern life declares it to be a good policy to try everything once. We had just spent a day off Abadan, and had eaten, breathed and slept in air reeking with oil, a smell to me quite nauseating. I never want to go *there* again.

We had spent two days in the roads off Koweit, that tantalizing, most Arabic town, forbidden to land. We had passed Bahrein near enough to see the pearling boats busy in the distance, though once more we were not allowed ashore. Now, we should spend the best part of a week at Ormoz, with at last a welcome chance to go ashore for a picnic or ramble.

Silence from the engine room, and the sudden rattle of anchor chains aroused me before 4 a.m. one morning a day or so later, but a peep through the port-hole showed only the pearly mists of a day about to break, and nothing but sea. Evidently the island was on the other quarter. Nearby jabbering of native voices made sleep an impossi-

bility, so, taking a quick bath, and slipping on two layers of hot-weather clothes, I ran up on deck.

Yesterday, sultry weather had brought clouds low over the Gulf to break in the night on the distant Persian hills beyond Bunder Abbas. Grey sky, a sullen, grey sea with inky shadows in the swell of each wave, and grim, grey bodies of small sharks a fathom below prowling about for the ship's waste.

To-day, the new-risen sun was chasing the dawn-mists away with its hidden magic. Sky and sea were alike the palest turquoise. Long, slow lines of waves came in the bay, one after the other in unbroken ranks, each showing a pure emerald curve.

The ship had swung on her anchor, and was now moored fore and aft in the roads before Ormoz about a mile out.

Ormoz lay bathed in the early sunlight. Its small peaked hills were curiously multi-coloured, red, purple, black, white, yellow and grey, but never a spot of green for tree or field. There were the ruins of an old fortress ashore, and a cluster of Arab mud-houses about it. All along the foreshore were dumps of some red earth, with incredibly tiny people like ants swarming about them. This was apparently the only place where life collected on the island. We rode at ease in a bay perhaps six miles across, with the arms coming round each side of us. There appeared to be ruins of some sort on one of them, but we could not see clearly.

Lying alongside us to shorewards were half a dozen small dhows, each manned by four or five men of all ages. From the top of each huge single sail to the end of the rudely botched rudder, each rope and plank, each man and boy, from shaven head to his long, bare feet, was masked with a brilliant blood-red earth that glowed indescribably in that strong sunlight. The bare muscular bodies shone like polished vermilion ivory, in which a flash of white teeth and eyeballs alone broke the uniform tone. Seen against the turquoise and emerald sea, their colour-scheme took one's breath away.

With fingers that positively trembled with eagerness, I tried to make water-colour notes of the vivid scene, but even pure vermilion, aureolin and permanent crimson failed to give the glow of such colour. The men themselves, grouped about in picturesque attitudes, only needed a trident apiece to be perfect red devils. Their chief men, our captain and Number One were all engaged in an argument, from which most of us tactfully withdrew and went down to breakfast.

"Enjoy the food before ye," grunted Number Two, helping himself heavily to curry, "for it's the last ye'll care for until we up-hook!"

They scowled anew at my enthusiasm for such colour. Bolting curry and toast, and seizing an orange, I fled to a privileged corner of the captain's deck, and painted hard all the morning.

Just as well that I did.

Suddenly, terms were agreed on. At a shout of command, the recumbent devils on the dhows sprang down into their tiny holds full of red oxide, and started filling rough, woven baskets with it, which were then hoisted into our forrard hold. As they shovelled, they chanted a sea shanty of their own. The cadence was intriguing. They kept perfect rhythm in their Arabic tune as they shovelled and sang. In the most extraordinary way, as I listened, memories of a midnight Mass at Notre Dame in Paris suddenly came to my mind . . . thoughts of a wonderful confirmation in the old cathedral at Concarneau in Brittany, with two hundred tiny, white-coiffed children kneeling before their priests . . . visions of a marvellous wedding of the mayor's daughter at Vannes, where nearly three hundred women of the neighbouring towns wore the gala embroideries and coifs of their districts. What could have brought such totally different pictures of the past to my mind?

Number Three stood beside me, looking down at the dozens of dazzling red natives working hard as they swung in true rhythm to their shanty.

" Odd how an influence lasts, though the reason is forgotten," he said. " Do you see that tiny patch away on shore to the left? That's the remains of an old Catholic mission built perhaps three or four hundred years ago when the place belonged to the Portuguese. The priests taught the people these chants. They're pure plain-song. Just listen. They don't know why they sing that. They don't understand the words, but what you hear is corrupted Latin handed down ignorantly by father to son all these years."

How we came to dislike the oxide before it was all aboard! Fine impalpable powder, we ate it with our food, drank it in cup and glass, wore it in clothes and hair, bathed in a muddy solution of it, and slept in gradually reddening bedding, though portholes and doors were all kept tightly closed.

Every now and then a choked shoveller would leap overboard to wash his pores clean in the crystal-clear sea, leaving a ruddy wake behind him that bothered the prowling sharks.

We were glad to go ashore whenever we could. As it was over twenty years since a white woman had landed there, the children ran shrieking from me, and peeped round slag-heaps and mud-huts.

We explored the ruins of the fortress. Part of the walls still standing had been built of sky-blue stones bound with mortar mixed with red oxide. They had all the brilliant effect of an old Pompeïan pavement. Marvellous lead cisterns with a tiny foot-track round were cut deep down in the rock. Though every drop of fresh water must have been carried across in the water-boats from Bunder Abbas, yet they were

much bigger than an ordinary swimming bath. They were perhaps fifteen feet deep, thirty feet wide, and seventy feet long, and their sides were cut by the penknives of scores of long-dead seamen visiting the spot. William Cordree visited it in 1649, and W. T. Stephens twenty years later. Parties from the *Bellerophon* and *Iphigenia* also left their marks, and countless tattooings and badges are all over the place, a lasting memorial to the bad taste of such visitors.

Ormoz is all pure mineral without a single drop of good drinking-water in it, though brackish water can be obtained at low tide just off one point. Every drop of drinking-water and all fresh vegetables come over in the water-boats from the mainland, arranged for by the company exploiting the concession to export the minerals. No native fauna or flora exist on these rich mineral hills, except an occasional tussock of coarse grass, though most natives keep a goat, and a dozen hens in their single-roomed huts.

The sands were coarse-cut and glistened curiously with a queer graphite, too poor and soft in quality to be of any use commercially.

We were rowed back to the ship on the last day glad to have breathed the pure air free of dust for a time. We found the steward finishing a bargain with one of the natives. Both sides seemed hugely contented. The steward had secured a large hand-woven basket made from the tussocky grass, with possibly fifty fresh eggs in it. A good haul. The native departed in a wide-smiling happiness, clutching *his* prize to a moist, bare bosom.

It was a bar of household soap!

A VILLAGE OF GNÔMES

By George Stanley.

After a rather uninteresting journey of three hours in the stony desert, the sight of Belad Sinjar was a welcome relief.

Belad, like most of the other Azidi villages in this part of the Mosul Vilayet, is built on a hill. Immediately at its back looms the grim Jabal, in front the desert stretches unending to the southward. The village itself is conical in shape, the " town hall " and police post, situated in the main street, being at the apex of the cone—a veritable village of gnômes. It is the largest stronghold of this queer tribe, and for centuries put up a stiff fight against Turkish aggression. When the Turks had possession of Iraq, Belad Sinjar was one of the parts they never succeeded in bringing into submission.

The Azidis are known as " devil worshippers," and in the past have suffered considerable persecution. Partly for that reason, it is almost impossible for an outsider to gain an insight into their beliefs; anyway, into their esoteric doctrines. Apparently, they argue that Satan is the author of all evil, but that one day *le Bon Dieu* will forgive him and receive him back into heaven. In the meantime, he can make things very uncomfortable for mankind, and therefore should be placated. As he will eventually be forgiven, so also will all who now placate him. Reference to the Power of Darkness may only be made by using the term " The Peacock King "; the colour of blue is reserved for His Infernal Majesty, and must never be exhibited anywhere outside an Azidi temple. Other tribes and sects are afraid of an Azidi's occult powers; some Assyrians, for instance, object to sleeping anywhere near them, as they declare their eyes glow in the darkness and they might cast spells upon them.

The usual crowd greeted our little party as it drove up the steep incline into the middle of the village, and it was as much as we could do to avoid running over them. Inquisitive and friendly, these Azidis were a strange collection, unlike either the Arab or Kurd. The most distinctive part of their dress was their headgear, which without exception was conical, the sort of hat associated with wizards and necromancers. Indeed, the whole place possessed an atmosphere of wizardry; the people glided about quietly and smoothly, even their intense curiosity not causing them to hurry. Without haste, without noise, they seemed to glide down from unexpected rocky crags to inspect something, and then fade away in a most mysterious fashion.

Nevertheless, a visitor cannot help feeling the whole time that no single action of his is left unobserved, be he even encompassed by four walls.

Many of the inhabitants had the top of the head shaven, leaving only a long fringe in front; others affected long hair plaited into pig-tails at the side and back. A conical hat surmounting a front fringe, a pair of dark, mysterious eyes above an unfathomable smile—and, lo, the figure fades behind a massive boulder. Yet withal a general cheerfulness pervading the gnômey atmosphere.

Having arranged for the cars to be looked after by the police, and settled down into our accommodation in the town hall, an inspection of the village and its bazaar was clearly indicated. On the whole, it was distinctly cleaner and less fly-infested than a normal Arab village; all the streets led to the apex of the cone, and consequently possessed tiresome gradients. The bazaar was small, and the usual Zakho rugs, Persian carpets, and copperware, so frequent in Arab bazaars, were entirely absent; the local industry appeared to be the production of coins, ancient and modern, of all nations, as a most varied selection was offered for our purchase. An inquisitive crowd followed us up and down the vertical paths, cheerful but silent. Our method of purchase in the bazaar seemed to appeal to them. On any article being produced, we offered a quarter of what was asked; this being refused, we offered to toss them for half of the price they asked or at the sum we named. The crowd entered into the game with gusto.

By the time we returned to the town hall, most of the inhabitants of the village had glided into the crowd—all still silent—so, in order to dispense with their embarrassing attention, we threw handfuls of annas into the air, and withdrew into the quarters whilst they scrambled for the coins.

Shortly after tiffin, our interpreter reported that a local sheikh had come to pay a visit. Going outside into the courtyard, we found a strange individual in a black abba embroidered with scarlet, round which a silver girdle supported a large revolver and cartridge-pouch on the one side, and a silver-studded cunjar on the other. He was an imposing figure, with his dark, piercing eyes and prominent nose dominating gold-encrusted teeth, and a black beard. Assuring us of his delight at our arrival, he hoped we would come round to his house in a few hours and partake of a meal. Rather against our better judgment—for experience had taught us to avoid meals with sheikhs, owing to their inordinate proportions—we expressed our willingness and he went off satisfied.

In due course, we set off towards his house about half a mile away from the village. It was large for its surroundings, and, after passing

through a couple of courtyards, we climbed some steps and were received on a balcony prior to entering his guest-chamber. The room contained an extraordinary assortment of objects. The furniture was poor except for a very old and black oaken table carved in some ancient fashion; on the walls were valuable Persian rugs, a banner with a Crucifix worked in golden thread—the history of which we could not obtain—a couple of guns, a few cheap prints of the Sultan of Turkey and European monarchs, and a large number of coloured advertisements. A French liqueur, a variety of golf balls, and a brand of chocolate were depicted in glowing colours, all and sundry being urged to test their merits.

A number of headmen from surrounding villages were congregated waiting to be presented to us. The formality of the proceedings was rather oppressive until the arrival of the usual gharwa (coffee), and that seemed to loosen their tongues.

In due course, the repast was announced, and we were ushered into another room, bare save for rugs and cushions spread on the floor around the dishes concentrated in the centre. The recognizable dishes of the meal consisted of cold chicken, eaten in our fingers, figs preserved in wild honey, likewise dates, and a cake-looking affair made from dried dates. Coffee, horribly sweet, and tea scented with rose leaves preceded a final loving-cup of sour milk embittered with lemon-juice.

Our host informed us that some ruins on the edge of the village had recently been exposed through a landslide, and he suggested that if we would care to see them, he would be very pleased to show us over in the morning before we left Belad. He produced one or two pieces of tablets taken from these ruins, and these were found to bear inscriptions in Cufick. Just before we left, he presented each of us with a few coins that he had found in a broken amphora embedded in the ruins.

The return journey in the dark took us longer than anticipated, and, by the time we got back into the dark, silent village, our thoughts turned bedwards.

The roof over our quarters in the town hall commanded a wonderful view of the desert; the air was cool, and the sky cloudless. All was silent, save for the tumbling brook which washed the walls of the building before decanting itself amongst the boulders at the foot of the village; even the usual pi-dogs had taken a night off, and the surveillance of the gnômes yielded place to that of a cloudless moon. By its light we examined the coins.

They bore the effigy of Alexander the Great.

CIVIL AVIATION DEVELOPMENTS: CURRENT AND PROSPECTIVE

By Major C. C. Turner, A.F.R.Ae.S.

The Big Flying Boat.

Each year of civil flying since the beginning, twenty-one years ago, has been a critical year, or so it seemed at the time, but never on the opening of a new year were there so many portents in the sky as there are to-day. The mere list of them would be long, and in referring to the three or four of greatest moment one is aware that some people would place them in different order. Probably, however, few would disagree with the view that the new phase to which the big flying boat is being brought in Germany, the beginning of actual construction in America of a floating aerodrome island, the opening of a new phase in airship development, the critical situation which the flying clubs are about to face, and the introduction of " big finance " to aviation, are all matters of the very highest significance.

The Dornier Do-X, notwithstanding the fact that this craft has not yet carried its full designed load aloft, proves one extremely important thing and, it must be admitted, confounds a school of aeronautical philosophy represented both in Great Britain and Germany. It proves what Doctor Dornier claims, namely, that there are important factors in construction which are constants, or nearly constant, their weights not increasing, or increasing very little, with the increase of gross weight, and that, therefore, the proportion of useful load does not diminish, or diminishes very little, with increase of gross weight. The Do-X in its present form may prove to be a commercial " white elephant," or at most a potential bomber, but it is at least a vindication.

Having fully recognized that fact and all that it implies, one may discuss the Do-X frankly without fear of being misunderstood. Misunderstanding otherwise would be only too easy, for, owing to what the French would call the " vulgarization " of flying news, the situation has not yet been correctly represented to the general public. Thus, the Do-X flight with 169 people on board was the occasion for much misrepresentation. On that flight the Do-X, according to what appear to be reliable reports, carried fuel for two and a half hours. At a liberal estimate, fuel and passengers (it is hardly likely the heaviest Germans were invited!), including crew, weighed about 14 tons, which, added to the structure weight of the flying boat, gives a total of 39 tons for a machine designed as a 51-tonner. Clearly, if the Do-X is unable to carry more, her designers' expectations have not been fulfilled. It is unfortunate that official detail figures—not in terms of number of passengers carried, but the actual weights of passengers and fuel—are not divulged. The omission to give them suggests doubts which, after all, may be unfounded, although one would imagine that, if the designed load had been carried, complete figures would have been published.

Pay Load.

The power-loading of the Do-X, with such loads as it has carried, is so high that she takes a run of 60 seconds, and this, of course, connotes a high landing speed, probably nearly 100 miles per hour, which is higher than would be tolerated by British practice as at present advised. It is, however, probable that in the case of big flying boats a high landing speed is perfectly safe. Meanwhile, the designers of the Do-X intend to make modifications, including the substitution of Diesel engines for the twelve " Jupiters," and it is understood that each of the present tandem pairs is to be replaced by a single unit, the extra wing upon which at present the engines are mounted to be retained as a kind of " pilot " wing. Other changes are probable, but none of them are likely to be made in the interests of reducing take-off and landing speed, but will be solely with the object of securing a bigger margin of lift for useful load.

It is hardly necessary to point out that something more is demanded than proof of a new aeroplane's capacity for flight: there must also be assurance of its ability to perform service commensurate with its cost; and clearly a commercial type has in this respect to fulfil very different conditions from those which apply to military aircraft, in which commercial profit and loss are factors ignored. Even assuming that the Do-X can carry the gross weight for which it was designed, there is some doubt in the minds of British air transport experts as to whether sufficient freight would be forthcoming to make it pay. It is useful to remember that, whereas with such " coarse " vehicles as railway trains and motor-buses an average of 50 per cent. of their pay-load capacity is sufficient, and that, broadly speaking, it does average about that, day in day out, with aircraft on a regular service an average of at least 80 per cent. of pay-load capacity is necessary in order to approach a paying basis independent of subsidies.

Theoretically, it is possible for a light aeroplane to fly the Atlantic, whilst the use, so far, of comparatively small aircraft for long duration and distance tests is significant of the fact they can carry a big proportion of useful load. Seventy light aeroplanes, weighing in the aggregate as much as one Do-X, could fly as far as the big flying boat, but they would require seventy pilots, whereas the crew of the Do-X is ten. Working personnel, however, is not the only approximately constant factor, for, as the Do-X proves, the weight of hull structure, installation, and other important items does not increase proportionately with increase of size.

British and German Design.

The Do-X appears to be regarded only as a stepping-stone, for Doctor Rumpler has been carrying out a model experiment in connection with the design of a much bigger flying boat, one of 10,000 h.p., having a weight, empty, of 50 tons, yet able, he claims, to carry 65 tons in addition. He calculates for 135 passengers, a crew of 35, a speed of 190 miles per hour, and a radius of 3,750 miles. Yet it is only in the year just ended that designs for flying boats of an all-on weight of 30 tons have been completed in Great Britain, and the question must occur, why has it been left to Germany to take the lead in this idea and its practical fulfilment? It is not a new idea, for in 1919 German

aeroplanes, surrendered to this country and examined here by British designers, unmistakeably foreshadowed big size-development, but were generally condemned for their clumsiness and coarse construction. In extenuation of British failure to develop on these lines it is claimed that our designers have been fully occupied by the need to develop an efficient air service according to Air Staff requirements, whilst the comparatively small scope for civil aviation has handicapped them, whereas the Germans have been able to play their favourite rôle of developing the big idea and the idea of bigness. One of our leading designers assures me that the German method is that of a kind of Couéism. Unlike the British, German scientists do not wait for each little step to be sanctioned by research and proof: they seize a big idea—in this case, that of the big aeroplane—and then say, "It must be possible; it is possible; we will make it!" And by constant, laborious, never-disheartened plodding, they succeed in the end. If this be the case, it is a characteristic well worthy of study, and possibly even of emulation.

All the big German aircraft are monoplanes, and to this division most German designers some years ago swore a fealty to which they have remained true. It is still open to question whether the monoplane or the biplane offers most advantages, and the fact that it is open to question after all these years shows that there cannot be much in it, one way or the other.* Probably the Germans realized this, and decided it was better to exploit one class to the utmost. Recently a leading British firm of constructors instigated research which was carried out at the N.P.L. and at Farnborough, and as a result it is claimed that for a flying boat of some 30 tons gross weight the braced biplane scores points over the monoplane. The Air Ministry is so far unconvinced that it is going to put the matter to practical test by means of a biplane and a monoplane built to the same performance specifications. These will be put through exhaustive trials in order to secure full data relating to cost of manufacture, maintenance, and operation.

Handicapped British Industry.

To those who have the mind to pause and reflect for a moment, the situation created by the costly development of huge aircraft is one of extraordinary interest. Why is this energy being given to the production of aircraft which certainly at present cannot be operated at a profit? It is patent that the leading countries are determined to foster air transport, and there is keen competition to secure a manufacturing and operating hold on the great air routes. On the one hand, we are told rapid communications diminish the risk of war, and on the other we are reminded of the immense strategic importance of Empire and world air lines. If this be not overstating the case—and I do not think it is—we cannot contemplate with equanimity the success of German aircraft in the world's markets, and, for that matter, of Dutch aircraft, too. The Fokker type is manufactured under licence in this country, and is being used in this country for business transport. There is every likelihood that a small Junkers type already in use here will soon be manufactured in England. What concerns us is not so much the fine aerodynamic differences by which the cantilever monoplane and the

* See Lecture "Monoplane or Biplane?" by W. S. Farren, in the Journal of the Royal Aeronautical Society, July, 1929.—Ed.

braced biplane are to be judged, but whether in the circumstances victory will be with the best or with the most successfully State-fostered, boomed, and marketed. It is not impossible that in such a case it is not the fittest that will survive.

The British aircraft industry, owing to the limited home demand for civil aircraft and the stationary rate of output for the Royal Air Force, is very severely handicapped in competition with Germany and America. Whilst there is no doubt we have produced the fastest aeroplane in the world, and also in all probability the machine possessing the greatest range on one load of fuel, and whilst it is freely admitted that in construction British machines are the best, there is no guarantee they will be able to hold their own in the market. Competition is becoming more acute, and our manufacturers are finding it increasingly difficult to maintain an output of aircraft and engines enabling them to hold their position at the greater prices they are compelled to charge.

Floating Islands.

The first seadrome will be towed out into the Atlantic this year to a point 350 miles from New York. If it proves satisfactory, more are to be built of far greater size, and not only the Atlantic, but the Pacific also will be studded by these remarkable structures. Is America making a colossal technical blunder, or is Great Britain about to be forestalled? Sir John Biles, Hon. Vice-President of the Institute of Naval Architects, throws some light on the technical aspect. In an interview in the *Observer* he says he is doubtful about the possibility of anchoring such structures in water several miles deep, as the weight of the chain required would be too great for its strength. " A bar of steel one-inch square and with a length of 7,500 feet would have a stress on it, if it were hung vertically in water, of about ten tons, and if it were 4½ miles long the stress would be 30 tons. The working stress of steel should not exceed ten tons per square inch. It is difficult, therefore, to see how a cable could be formed sufficiently strong to moor an aerodrome of 30,000 tons displacement in mid-Atlantic." Sir John Biles adds that, by putting in engines and boilers, and thereby enabling the seadrome to keep position, the difficulty might be overcome; moreover, that the seadrome need not be positively fixed, and, if equipped with lights, wireless direction-finders, and signals, there is no reason why it should not be allowed to drift over a given area. " At present it seems that attention may have to be directed to the use of some type of sea anchor and some propelling mechanism."

Notwithstanding this criticism American engineers, supported, I am informed, by many British engineers, are proceeding with the moored floating island. They claim they have solved all the problems, and that even the objection that corrosion and the necessity for frequent dry-docking is unfounded. But, after all, is it not possible that airships will make seadromes unnecessary?

There is no need to dwell on the fact that if either the seadrome or the airship is a success it would revolutionize transocean travel. What remains to be proved is that the demand for air transport across the ocean would be so great as to defray the cost of either undertaking. Capital in the case of the seadrome is displaying great courage, for it must in any case wait a long time for adequate return. It is impossible to say what amount of passenger and mail freight would be available,

but it is well to remember that first-class mail—that is to say, sealed letters and postcards—from North America to Europe amounts to no more than 35 tons per week, whilst in the reverse direction it amounts to only 32 tons, of which 16 tons are British.

The development of the seadrome may soon raise an international question, for these floating islands will fly national flags and we may ere long find the Stars and Stripes flying in European territorial waters.

Airships—The New Phase.

Airships in their new phase have had a good send-off, and prophets of disaster have been confounded. The R101 moored at the towerhead has been exposed to a heavy gale, and she did not fulfil the prophecy that in these conditions her fabric would be " torn to ribbons." But it is more than ever clear that in her present form she is a research and experimental airship, and that we shall have to wait for some years for airship lines to the Dominions, even assuming that the building of new airships will immediately be begun. A delay of a year at least is certain, for Lord Thomson, after providing for the maintenance of the Royal Air Force and for the payment of subsidies to Imperial Airways, is being supplicated for assistance to three things: airships, light aeroplane clubs, and high-speed research. He has found it expedient to make an early announcement with regard to the Schneider contest and high-speed records. No doubt he is powerfully urged by his own predilections to continue to foster airships. The Air Estimates promise to be exceptionally interesting.

Airships will for some time provide a contentious topic, for they have many enemies, and they sorely need well-informed and unrhetorical advocacy. It is only natural that their friends should dwell rather upon their capabilities than upon their limitations, but it is an extremely healthy sign that the staff at Cardington have taken the public into their confidence as regards the handicap under which the R101 suffers on account of the heavy weight of her present engines and the fact that one of these engines is reserved entirely for reverse. Equally, we know that on account of the difference in temperature, an airship of this size can carry a load bigger by about eight tons starting from England than starting from Egypt, whilst proceeding to India from Egypt she would be still further handicapped in the matter of freight capacity by the fact that she would have to surmount high country immediately after the start.

Airships and War.

Little popularity is to be won these days by referring to the bare possibility of war, and, as a consequence, airship policy in this country (not in the United States) has been justified throughout on the score of Empire air communications. There is, in fact, a large body of opinion which holds that the airship can never be of any use in war. This, however, is by no means the universal opinion, and a franker consideration of the possibilities than is usually accorded opens up many big questions. Airships can carry, launch and re-embark single-seater fighters, and, although in an area swept by hostile aircraft they would be at a disadvantage, it needs little imagination to discover circumstances, regions, and times when they could be employed very effectively in this way. I am not at all sure it might not be possible for an airship carrier

to be ready with interceptor fighters at a great height to meet an expected bombing attack. Quite definitely the airship must also be considered as an aircraft carrier to accompany a fleet at sea.

But as a mere carrier of munitions and troops the airship offers great possibilities, as was shown during the war when a German Zeppelin set out to give assistance to German forces in East Africa. That airship actually flew as far as Tanganyika, and failed of its mission not through any disability of its own.

The Flying Clubs.

This year, most of the subsidized aeroplane clubs are coming to the end of the agreement under which they are subsidized by the Air Ministry.

At the end of 1925, there were only five clubs; at present there are twenty-seven in England, ten in Australia, sixteen in Canada, four in India, nine in New Zealand, nine in South Africa, and one each in East Africa, Singapore, and the Irish Free State. They are nearly all subsidized in some way, and there is no need to dwell on their activities and their success in training many hundreds of pilots.* Last year, clubs in Great Britain cost the State £16,000, as compared with £349,000 for Imperial Airways. Throughout their existence, the aeroplane clubs have not cost the British Government more than about £50,000. The late Government stated that no further support could be given after the termination of the present agreements, but at the same time granted a subsidy to a commercial concern which had in its programme the creation of light aeroplane clubs all over the country. Essentially the position is one that calls for very serious reconsideration by the new Government, for the aeroplane clubs are doing work which could not have been done in any other way. Cessation of the subsidy would compel many of them to close down, whilst continued help would not cost much and would be a diminishing commitment in view of the fact that well-managed clubs steadily improve their financial position. The Air Ministry, of course, is faced by some pretty big problems, for at a time of increasing expenditure on social services it will find difficulty in obtaining money for purposes which only a minority of the public recognize as vitally important to the well-being of the whole community.

Civil Aircraft and Defence.

National defence is not so simple a matter as it was when popular understanding need concern no more than broad issues as to the number of battleships and cruisers and of regiments of the line. War no longer is the sole concern of standing fleets and armies; it is the question of the mobilization of all the resources of the nation. With it is involved transport of all kinds, air transport and aircraft manufacture very vitally. With all the world talking glibly of the attainability of unbreakable peace, the difficulty of arousing the public to a true appreciation of the facts of the case is only too clear, and those who essay the task receive no thanks and are even accused of being reactionary. Lord Thomson, speaking at the banquet to municipal authorities recently assembled to consider the best means of increasing the number of muni-

* In reply to a recent question in the House of Commons, the total membership of the thirteen subsidized Flying Clubs in Great Britain was given as 2,047.—Ed.

cipal aerodromes, put the principle of national defence as well as it has ever been put. He said that the greater relative growth of foreign civil aviation was not a menace because we could regard civil aircraft as potential bombers; we possessed an air force, small but efficient, which could deal with any first onslaught; that it was not necessarily the largest, the richest, or the most populous country which was secure, but that national efficiency was the key to the situation. The point, of course, is that Britain must have its efficient air-line system, its Empire lines, and its healthy and expandable aircraft industry; and one thing we must work for is a network of aerodromes all over the country which, besides fulfilling their primary purposes, would add so greatly to the efficiency of the air service. Unfortunately, there is a limit to the enterprise which municipalities can afford. It is true that money laid out will ultimately come back, and it is true there is practically no risk, even if development of flying be not quite so rapid as some speakers and writers foretell. That an aerodrome can be provided at the cost of one mile of arterial road is a fact that may count for but little: municipalities may not be in a position to invest in this particular form of enterprise. They have been urged to do so, but aviation must fulfil its part of the bargain. There can be no doubt that both Hull and Manchester expected a quicker response to their enterprise, and Hull certainly was led to believe there would soon be a chain of aerodromes from Belfast, in Ireland, to the East Coast of England, and that Hull would be an important station for air lines to the Continent. When the Lord Mayor of Hull remarked that he looked to Imperial Airways to send their flying boats and seaplanes to Hull, one knew only too well that Imperial Airways does not possess sea aircraft even for its own immediate needs.

As already said, bound up with these questions is the state of the British aircraft industry, and it is precisely in this respect there is grave reason for disquietude, for when one observes the irruption of foreign aircraft for use in this country on air-taxi services, the absurdly small business open to aircraft makers for Imperial Airways and the very small demand for new machines for the India and South Africa services, Lord Thomson's speech takes on the character of a grave warning.

Finance Comes In.

It is no secret that the world of finance is convinced of the great future of flying. Not only in the United States, but in Great Britain also, the big machine of finance has been set to work. Big money handled by big people is now available, and this will be used both to coalesce interests and to fertilize and "farm" new mechanical contrivances. Within limits, and with certain safeguards, co-operation is not only inevitable, it is desirable. In the case of aircraft at present, moreover, there is no hope for the industry, no matter how organized, unless reduction of cost, increase of efficiency, and the safety of air travel are secured. Unless these be kept steadily in view, capital will be wasted.

The Empire Mails.

From the days of its first postponement, some three years ago, the India air mail has been the occasion for great anxiety. The recent series of accidents, which are referred to both by Ministers and by Imperial Airways as "extraordinary bad luck," had the effect of diverting the

European section of the route, whilst Italy's attitude compelled resort to a route, by way of Budapest, which is bound to prove almost, if not quite, unworkable during the winter months. From Athens to Egypt the mails are carried by R.A.F. "Southampton" flying boats for the time being.

The inauguration this year of, at any rate, one section of the through-Africa route should mean a real start of Imperial air communications. At present, Captain F. Tymms, Chief Technical Assistant, Department of Civil Aviation, and Captain T. A. Gladstone are in Africa settling details of ground organization. That is as much as can be said for it, and one would like to see more indications of a more vigorous development policy on the part both of the Government and of Imperial Airways.

AIR ARRANGEMENTS AT MALTA.

LORD STRICKLAND'S SUGGESTIONS.

(House of Lords, Tuesday, November 12th, 1929.*)

Lord Strickland [Head of the Government of Malta] rose to call attention to the urgent necessity of better provision for civil and Imperial aircraft at Malta and to move for papers. He said the object he had in view was to preserve for Malta, and for the Empire, the advantages in regard to air traffic that England and Malta had enjoyed in regard to shipping since the early Phœnician navigators who founded colonies on both islands. At present there was only one landing place on shore for aircraft, and the harbour was not sheltered for either flying boats or aircraft-carriers. The most suitable place for landing on the water should be adequately protected without delay, and the overcrowded landing place on shore must have adjuncts to meet naval and civil needs that were clamouring for attention. In the Bay of Marsa Scirocco a breakwater was imperatively required for flying-boat development. Among the papers for which he asked was the estimate for this breakwater, which had long been discussed, together with any sketch plans that might be available.

They must have a high road to India, China, Australia, and Africa by air, and Nature had indicated Malta as the first stopping place. The matter had become urgent, because hitherto the main air route to east and south had had a tendency to be diverted from Malta to foreign competitive centres, because it was only recently that flying boats had been constructed to cover safely the transit from Malta to Egyptian territory.

The importance of flying boats had been tardily realized; it was now established, and all the energy available should be concentrated to bring this circumstance to fruition so that once again Malta might offer strategical supremacy in the defence of Western civilization against possible and ultimately inevitable Eastern rivalry. Leagues of Nations

* "The Times," November 13th, 1929.

had grown and faded away through the centuries, both in Western Europe and Eastern China; they had always lacked adequate sanction, and they would continue to do so when the fast-breeding hordes of Asia again moved westwards. The last great clash between East and West ended at Malta, when the Turks failed to take that last rampart of Western civilization because of the foresight in permanent preparations displayed by the Knights of St. John. Such foresight had not yet commended itself to the Government. There were administrative as well as financial difficulties when rapid co-operation between two Governments had to be secured in Malta.

His motion tended to achieve more rapid exercise of Imperial control by hastening the publication and discussion of correspondence as to causes of friction and delay connected with Section 41 of the Constitution. So long as civilian air traffic must develop side by side with naval and Air Force activities legislation and money would be required from both Maltese and Imperial sources; and so long as the procedure in regard to legislation in the Malta Parliament was excessively difficult there would be undue delay, and so long as control of details was duplicated and disorganized there would be deadlocks. The representatives of the Maltese taxpayers would not be ready to vote money if it was contended that the King's Ministers in Malta had no right to administer anything connected with reserved matters, or so long as the part they had in fact and inevitably was minimized by the obviously illogical and illegal contention that because the King's Ministers in Malta could not "legislate" as to air traffic they therefore could not administer in relation thereto. There could not be two Ministries in Malta, and while the King's representative should continue to have absolute and unchallengeable power over all that concerned the air when having a bearing on defence against warlike aggression, the Governor should not be debarred from authorizing the discussion to legislation where civil and Air Force interests overlapped, provided that he had the approval of the Secretary of State, and ample opportunity to amend and disallow.

In reply, Lord Thomson, Secretary of State for Air, said that the desire and ambition expressed by Lord Strickland that Malta should be a Clapham Junction of the air in the Mediterranean was entirely in accordance with his (Lord Thomson's) views. But the time was barely ripe for that yet. He did not suppose that the time would be ripe until the range of aircraft had been considerably increased. It was, however, a consummation most devoutly to be desired.

It might be of interest to state the actual situation in Malta at the present moment. There was a Royal Air Force aerodrome at Hal Far which was already very congested; it was not large enough for Air Force requirements. There was a seaplane base at Cola Frana, an auxiliary base at Cola Mistra, and another at Marsa Scirocco—three little bays suitable for the use of seaplanes. Lord Strickland suggested that a breakwater should be constructed at Marsa Scirocco in order to improve the facilities there. He was informed that the cost of such a breakwater would be £25,000,000, and he could hold out no great hopes that that sum would become available. There was another aerodrome projected in the interior of Malta for the Royal Air Force at a place called Safi—that was primarily to relieve the congestion at Hal Far—and he was told that another site had been reconnoitred at Ta Kali. Sir Alan Cobham, during a visit to Malta, inspected this site and pronounced it

suitable for the purpose of a civil aerodrome if the Legislature desired to put it up. The Air Ministry would raise no objection to that site being developed as an aerodrome, but he would ask Lord Strickland to consult the Ministry first in regard to the arrangements for construction, because there would be this limiting condition, that in case of emergency the aerodrome would have to be taken over by the Air Force.

The noble lord had referred to some Constitutional matters which affected the question of aerodromes to some extent. Section 41 (*c*) of the Malta Constitution Letters Patent of 1921 laid it down that " legislation [by the Malta Legislature] shall not extend to the control and regulation of aerial navigation and the compulsory acquisition of land and buildings for the purpose of aerodromes or for any other purpose connected with aerial navigation or aerial defence." In other words, this question of aerodromes fell within the category of reserved matters. The Colonial Office, so far from doing anything to obstruct the project of the Malta Government to construct an aerodrome, had sought to overcome the legal difficulties, within the terms of the Constitution, in order to make it clear that from a practical point of view the project was approved and welcomed. With a view to reconciling the legal and practical considerations two alternative courses were suggested to the Malta Government in November, 1928, by Mr. Amery. They were very reasonable alternatives, but Lord Strickland appeared not to have been satisfied with them, but to have desired the Malta Legislature to be given power to legislate on reserved matters. What the noble lord suggested was an amendment of the Constitution.

Lord Strickland: An amendment of one word.

Lord Thomson replied that the amendment of the Constitution by one word was quite sufficient to make it an amendment. His Majesty's Government found considerable objection to meeting that view. That objection was based on the principle that certain matters must be kept in the hands of the Imperial Government, and that principle must be upheld. That principle was very much at stake in the case of Malta—at any rate, it was at stake while Malta retained its importance in the scheme of Imperial defence—and no amendment could be accepted. This particular case of aerodromes was of a border-line character under a dyarchial form of government. He appealed to the noble lord to work that form of government with all its difficulties, in that spirit of good will which was essential to the development of the system, and he felt sure that if he would approach the question in that spirit an amicable solution would be reached. The Government would consider laying papers on the table referring to the noble lord's somewhat lengthy dispute with the Colonial Office, but as to the other papers in regard to the seaplane base, he could not pledge himself to do this without consulting the Admiralty.

Lord Strickland withdrew his motion for papers.

NOTES ON AIR SERVICES IN CANADA

There are three branches in the Civil Air Services which come under the organization of the Deputy Minister of National Defence:—

Civil Government Air Operations.—This branch is controlled by a Director who is an officer of the Royal Canadian Air Force, and is charged with the carrying out of all air operations required by any Dominion Government Service, such as forest protection, survey, and many other miscellaneous operations which are required to be carried out for the Departments of the Interior, Mines, Agriculture, Indian Affairs, Customs, Public Works, Railways and Canals, Marine and Fisheries, etc.

The Headquarters of this branch are situated at Ottawa, the operating bases are at Winnipeg, Manitoba, High River, Alberta, Ottawa, Ontario, Dartmouth, Nova Scotia; there are also sub-bases at Lac du Bonnet, Manitoba; Norway House, Manitoba; Cormorant Lake, Manitoba; Grande Prairie, Alberta; Ladder Lake, Saskatchewan. All the operating bases and sub-bases are made up of personnel of the Royal Canadian Air Force.

The Central Stores and Workshops for the Civil Divisions, also the Photographic Section are administered as part of this branch, and are located at Ottawa.

Control of Civil Aviation.—The head of this branch is the Controller of Civil Aviation. He is responsible for the administration of the Air Regulations and the control of Commercial and Private Flying in Canada, the location and equipment of airways, the construction of Airship Bases, and has jurisdiction over Flying Clubs. The branch has three divisions—Air Regulations, Airways, and Information.

The Air Regulations Division is in the charge of a superintendent. The duties of the division comprise the registration and licensing of aircraft, and the issue of their certificates of airworthiness; the examination and licensing of pilots, navigators, and air engineers; prevention of dangerous flying; inquiries into the causes of air accidents; international flying, including the import and export of goods by air and immigration and emigration of persons by air.

The Airways Division is also in the charge of a superintendent, who is responsible to the Controller for the inspection, licensing and registration of airports; the supervision, development and maintenance of Government airports; the investigation and development of air-mail routes, including communications for the collection and dissemination of meteorological reports.

The duties of the Information Division include the collection and dissemination of information, records and statistics of commercial operations, light aeroplane clubs and accidents, etc. A liaison is also maintained with other Governments of the Empire on all subjects appertaining to Civil Aviation matters.

Aeronautical Engineering.—The head of this branch is the Chief Aeronautical Engineer, who is a technical officer of the Royal Canadian Air Force. He acts as consultant engineer to the Department of National

Defence, both for the Royal Canadian Air Force and the Civil Divisions, and he is responsible for all questions of design, airworthiness of aircraft, equipment, works and buildings, and other similar items of a technical nature.

Light Aeroplane Clubs of Canada.

There are now over twenty Light Aeroplane Clubs organized in response to the offer of assistance made by the Canadian Government late in 1927, with a view to increasing interest in aviation. The scheme is to place facilities for learning to fly within reach of as many people as possible, and to provide aerodromes in as many localities as possible.

The conditions under which Government assistance is given is briefly outlined as follows:—

(*a*) Each club to provide its own flying field.
(*b*) Arrange for the services of an instructor and air engineer.
(*c*) Have at least thirty members prepared to qualify as pilots.
(*d*) Have not less than ten members already qualified.

The assistance given to each club satisfying these conditions is:—

(*a*) Two aircraft and engines as an initial grant.
(*b*) A further issue annually for a period of five years, of one aircraft complete with engine, providing the club purchases an aircraft of equal value.
(*c*) The sum of $100 is granted to each club for every member who qualifies as a pilot.

It is needless to say that the Light Aeroplane Club movement has fulfilled all expectations, the total membership being nearly 5,000. Many of the clubs not only operate in the summer, but also throughout the winter when the aircraft are fitted with skis where snow makes this necessary.

As a result of the activity of the club movement, there has been a very large amount of touring done by light aeroplanes and a number engaged in exhibitions and contests. Many of the clubs hold their display days. The movement has also led to a big increase in the number of owners of private aircraft, and many pilots have taken up aviation as a vocation, having obtained employment in the many air operating companies which are in Canada.

AVIATION IN FOREIGN COUNTRIES

CZECHO-SLOVAKIA.

The Avia Company, which is owned by the Skoda firm, the most important of the Czech aircraft firms making aeroplanes of wood construction, has acquired the licence to build two types of Fokker transport aircraft—the F. VII and the F. VII-3m. This firm has had great success with their BH.II, a two-seater monoplane fitted with a 60 h.p. Walter engine, which is used either as a training machine or for touring purposes. Licences to construct

this type have been acquired by Belgium and Switzerland, while negotiations are proceeding for the licence to be sold to U.S.A. also. The B.H.33 is another type which is regarded as one of the firm's best efforts, and has been demonstrated before representatives of Roumania, Yugo Slav, Turkey, France and Russia, the latter having placed a trial order. This is a single-seater fighter biplane fitted with either a Jupiter 480 h.p. or Jupiter 380 h.p. supercharged engine, and is stated to give an exceptionally good performance.

FRANCE.

The Air Ministry.

The French Air Ministry is still engaged in grappling with the problem of taking over control of national and civil aviation. On the technical side steady progress has been made, and an organization has been developed to meet both civil and military needs. The study of safety in the air has received special attention, and a committee representing all branches of aviation has been set up to examine this question.

The amalgamation of civil aviation firms and aircraft construction companies has been encouraged with a view to greater economy and efficiency. Colonial aviation has received attention, and plans for development are being pushed along.

GERMANY.

The Aviation Budget, 1929-30.

The following sums have been voted for German Civil Aviation for the financial year 1929-30. The corresponding figures for 1928-29 are also shown for purposes of comparison.

	1929–30.		1928–29.	
	R.M.	£ (approx.)	R.M.	£ (approx.)
1. Air traffic W/T Stations	1,629,750	79,500	1,067,895	52,092
2. Exhibitions and Competitions: Prizes and cost of preparation ...	200,000	9,756	2,000,000	97,560
3. Meteorological Services	1,195,000	58,292	1,800,000	87,804
4. Promotion of general efficiency and technical development of air transport	*6,180,000	301,463	18,800,000	917,073
5. Maintenance of Adlershof Experimental Station	1,600,000	78,048	1,500,000	73,170
6. Promotion of air transport ...	*10,550,000	514,634	20,165,000	983,658
7. Development of air stations ...	100,000	4,878	1,050,000	51,219
8. Equipment of new wireless stations	273,000	13,317	450,000	21,951
9. Illumination of night routes, maps and charts for navigation ...	350,000	17,073	200,000	9,755
10. Training of professional pilots, promotion of sailing flight, light aeroplanes, ballooning, aviation displays, etc.	2,610,000	127,317	4,650,000	226,804
11. Contributions to Gottingen Experimental Establishment and other Research Institutes ...	770,000	37,555	150,000	7,317
12. Contribution to maintenance of a permanent exhibition of aircraft and equipment	6,500	317	1,500	73
13. Airship development	2,500,000	121,951	700,000	34,146
	27,964,250	1,364,100	52,534,395	2,562,622

* Plus the loans mentioned below.

The drastic reductions in the current budget are due largely to adverse criticism of the heavy subsidies awarded to civil aviation in the past and the maintenance of unnecessary and uneconomic internal air lines.

As a result, however, of vigorous protests against the Government's action, a compromise has been effected whereby the Reich is to supplement items 4 and 6 by the following loans :—

Under Item 4.—A loan of 9 million Marks (£439,024) to the Aircraft Industry).

Under Item 6.—Two loans amounting in all to 12 million Marks (£585,365) to the Deutsche Luft Hansa A.G.

Thus in all very little less money will be forthcoming from the State during the current year for civil aviation. In addition, there are, of course, the sums allotted by the various States, Provinces, Municipalities, etc.

ITALY.

Italy continues to improve her aircraft trade relations abroad. As previously reported, in January of this year an amalgamation of the firms of Caproni of Italy and the Curtiss Aeroplane Company of U.S.A. took place, entailing certain exchanges of manufacturing rights and co-operation in design between the two firms. We now hear of the formation of an American Aeronautical Corporation, with works near New York, for the manufacture in America of the Savoia type of commercial aircraft, the S.55. Signor Marchetti, the designer of the S.I.A.I. (Savoia) firm in Italy, is one of the directors of the new company, which has acquired the sole rights for North America and Cuba for the construction of this successful type of aircraft. The S.55 is a twin hulled monoplane flying boat having two 500 h.p. Isotta Fraschini " Asso " engines, and is used extensively both on Italian air lines and in the Italian Air Force.

In addition, recent purchases of Italian aircraft have been made by the Governments of Lithuania, Portugal, Roumania and the Argentine.

Work is proceeding on the construction of a new airport for the city of Milan. At Linate del Lambrate, about four and a half miles from the centre of Milan, an artificial lake 8,200 ft. long, 650 ft. wide and 25 ft. deep is being built, which will form the seaplane base ; whilst at Taliedo, two miles distant, the aerodrome section of the airport is being laid out. A specially constructed road will connect the two. It is estimated that this work will cost 10,000,000 lire (approximately £107,820).

SWITZERLAND.

" An extensive scheme for the reorganization of the Swiss Army Flying Corps is now being considered by the Federal Military Department. This scheme, which will involve the purchase of 60 fighting and 45 observation aeroplanes, will necessitate the grant of 20,000,000 Swiss francs, of which total it is proposed to set aside 10,000,000 fr. for the acquisition of ground equipment and material. The expenditure is to be spread over several years. These figures, however, are not definite, and are liable to alteration when the scheme has been examined by the Federal Council. In view of its importance, it will in all probability be submitted also to the Federal Chambers."*

It is thought probable that the machines will be purchased abroad.

* Extract from " The Times Trade and Engineering Supplement," Nov. 23rd, 1929.

UNITED STATES.

Department of Commerce.

Licences issued up to August 10th, 1929.—The following statistics have recently been made available regarding the licensing of pilots, aircraft and mechanics :—

	Pilots.	Mechanics.	Aircraft Licences.
Total licences approved ...	8,666	—	6,968
Total licences active ...	6,891	6,256	—
Total licences inactive ...	1,775	348	—
Total licences pending ...	1,602	—	862
Total licences disapproved	807	—	417
Total licences cancelled ...	2,534	—	2,043

Flying students—permits approved, 21,732.

In addition, over 5,350 letters of identification have been issued by the Department of Commerce. (These letters are issued in cases where licences have been applied for, and are valid until such time as the licence is granted.)

Air Mail Routes operating : Mileage.—On August 1st the following figures were given regarding the above :—

Miles of mail airway operating	24,088
Total miles of airway (mail and non-mail)	32,196
Total miles of airways lighted for night flying ...	12,248
Total daily average aircraft mileage	75,626

The number of airports in the United States listed in the records of the Department of Commerce on July 31st, 1929, was as follows :—

Municipal airports	428
Commercial airports	439
Intermediate airports	263
Army Air Corps stations	70
Navy and Marine Corps stations	14
Marked auxiliary fields	269
Other Government airports	2
Total	1,485

In addition, there were 1,174 airports proposed.

Aviation Expenditure—Army, Navy and Civil.—The total expenditure on aviation by the various U.S. Government departments over a period of years is stated to be as follows :—

	£ (*approx.*).
Army since 1899	204,627,817
Navy since 1912	69,514,643
Post Office since 1918-19	830,000*
National Advisory Committee for Aeronautics since 1916	704,903
Agriculture since 1922-23	50,600
Department of Commerce since 1926	1,955,168
Total	£277,683,131

The number of aircraft received by the Navy between 1911 and 1926 was 3,398 (all types), and by the Army between 1909 and 1926 15,422 (all types), a combined total of 18,820 aircraft.

* Handed over to civilian operators in 1927.

AIRSHIP NOTES

GREAT BRITAIN.

(See Article " Civil Aviation," p. 185).

UNITED STATES.

Airships: " Hooking on and Off " of Heavier-than-Aircraft.

On July 23rd, 1929, three attempts were made by a United States Navy pilot to hook on and release a standard reconnaissance plane to the airship Los Angeles while in flight. All three tests were successful. It is said that these experiments were conducted with a view to obtaining data in preparation for manœuvres of a similar nature with the two new airships of six and a half million cubic feet, which are to be constructed for the United States Navy. It is understood that accommodation for carrying heavier-than-aircraft has been made in the plans of these new rigids.

During the last week of August further demonstrations took place, and a passenger in the airship was transferred to the airplane which, on being released, returned to its base.

Similar hooking on and off experiments were carried out in this country in October and December, 1925.

United States Navy All-Metal Airship, Z.M.C.2.

This airship, which has caused much controversy as to whether it would ever fly, was successfully tested out recently in actual flight, but a total of thirty hours' flying time is necessary before acceptance by the Navy Department. Apart from the two trial flights the airship was flown from Detroit to Cleveland and back on August 25th, a distance of approximately 370 miles, at a cruising speed of 59 m.p.h.

The Z.M.C.2 is 149 ft. 5 ins. long and 52 ft. 8 ins. in maximum diameter, giving it a fineness ratio of 2.85. It will hold 202,200 cubic feet of helium gas, and has accommodation for a crew of four. The engines installed are two Wright 220 h.p. engines, giving the airship a maximum speed of more than 60 m.p.h. The cruising range is estimated to be approximately 600 miles.

Three distinctly radical departures from conventional lighter-than-aircraft construction are contained in the structure. It is all metal, except for the two balloonets within the hull by means of which the pressure of gas is controlled. The skin is constructed of Alclad, with a gauge of ·0095 inch. It is fitted with an entirely new control method, having eight fins round its tail, using four of them as rudders and elevators. These fins are set 30 feet forward of the tail to increase stability. Finally, it has an unusually low ratio of fineness for an airship of its size.

The airship was not designed as a craft with commercial possibilities, but was constructed purely as an experiment, and is said to have a considerable number of military, naval and scientific uses. It is claimed by the builders that the gauge and strength of the Alclad metal used in the construction are such that an airship seven times the size, but of the same type,

can be produced without increasing the width or weight of the metal per square inch.

The Aircraft Development Corporation constructed the airship, and it is said that the total cost is approximately £230,000. The cost of the airship to the Navy Department is but £60,000.

JAPAN.

New Naval Airship.

It is reported that a new airship is under construction for the Japanese Navy.

According to the Press the airship is to be of the semi-rigid type, with two 130 h.p. Maibach engines, the volume of the balloon will be 7,500 metres; length, 81 metres, and endurance 30 hours.

It is expected to be completed shortly.

SPAIN.

In the course of a lecture at Oviedo on his voyage in the Graf Zeppelin, Colonel Herrera of the Spanish Air Service, expressed his opinion that the air service between Seville and Buenos Aires would be in operation within a year, and that the service would probably be opened by the Graf Zeppelin. Officers of the Graf Zeppelin, interviewed at Friedrichshafen by a Press correspondent, stated that there were still certain difficulties in the way before a regular service could be inaugurated. In the first place suitable airship sheds would have to be constructed both in Seville and Buenos Aires, as well as a mooring mast and refuelling stations on Brazilian territory.

It was stated, moreover, that even if all these preparations were concluded, it would be very unlikely that the Graf Zeppelin would operate the Spain—South America line regularly, although it might make a propaganda flight to the Argentine to inaugurate the new service.

CIVIL AVIATION

Great Britain.

Director of Civil Aviation ...	Air Vice-Marshal Sir W. Sefton Brancker, K.C.B., A.F.C. (retired).
Deputy Director of Civil Aviation	F. G. L. Bertram, Esq., C.B.E.

Australia.

Controller of Civil Aviation ...	Lieut.-Colonel H. C. Brinsmead, O.B.E., M.C., Department of Defence, Victoria Barracks, Melbourne.

Canada.

Controller of Civil Aviation ...	J. A. Wilson, Esq.
Superintendent, Air Regulations	Squadron Leader A. T. Cowley.
Superintendent, Airways ...	Squadron Leader J. H. Tudhope, M.C.

India.

Director of Civil Aviation ...	Lieut.-Colonel F. C. Shelmerdine, O.B.E.

BOOK REVIEWS

THE WORLD, THE AIR, AND THE FUTURE. By COMMANDER SIR CHARLES DENNISTOUN BURNEY, Bart., C.M.G., R.N. (Ret.). (Alfred A. Knopf. Price 21s.)

Reviewed by AIR COMMODORE E. A. D. MASTERMAN, C.B., C.M.G., C.B.E., A.F.C. (Ret.).

In the first half of this book, the author gives his views on:

" The actual and potential uses of Air Transport in

(1) the issues both of war and of peace, as they are likely to affect the economic and strategic position of Great Britain;
(2) the development and unification of the British Empire; and
(3) the reconstruction of the international situation."

In another part he proceeds to the technical considerations involved, and an estimate of the probable lines of development of aeronautical science, and in a final chapter, to certain constructive proposals " on questions of administration and policy."

The three types of aircraft—the airship, the land aeroplane, and the flying boat—are treated separately, and some interesting comparative data are given.

In the development of civil aviation, the author foresees that the large airship and flying boat will run on the trunk lines of the Imperial air system, which will be fed by aeroplane routes, " linking every town and province with the main arteries."

Whilst the main portion of the book will doubtless be studied by all interested in the future of aviation and the Imperial and international considerations involved, it is considered that the author's views on the question of the large airship should be of especial interest.

This because it is due to him more than to any Englishman living to-day that funds have been made available by successive Governments since 1924 for the construction of the two giant rigid airships now undergoing their trials.

The author is closely associated with R100, built under his direction by the Airship Guarantee Company, Ltd., at Howden, Yorks, while the R101 has been built by the Air Ministry at the Government Airship Works at Cardington, Bedfordshire.

After the R38, a war-design product, broke in the air over Hull on August 23rd, 1921, with a loss of forty-four lives, including those of Air Commodore Maitland and many of the best British and American airship personnel, all airship work in this country ceased, and for a time it seemed unlikely that it would again be resumed.

Undeterred, however, by this and other accidents to airships, Commander Burney, whose reputation was already established by his successful development of the principal device by which British and Allied shipping was protected against mines in the war, flung himself with his accustomed energy and determination into the support of the large rigid airship as a means of commercial transport.

Aided by his position as a Member of Parliament, he carried out successful propaganda under what was known as " The Burney Scheme," and, although the Government modified this scheme by introducing an element of competition, in the shape of a Government airship, to be built to their own design, nevertheless it was his driving force alone which caused the large airship to be again revived.

Support he must have found, as otherwise he would have been faced with an impossible task, but in the absence of his initiative, it is more than doubtful whether any action would have been taken, at least for some years.

In deference to those whose opinion it was that to be efficient commercially, a considerable increase in size over what may be termed the " end of war Zeppelin size " was necessary, the new airships were designed to be about twice as large as any that had previously been constructed in this or any other country.

To convey to the reader what this doubling of size means in the work involved in research and design, in the provision of shed accommodation, mooring masts and hydrogen equipment, would take too long, but that it was a very big step to take should be fairly obvious.

In order to ensure against any danger of weakness in construction, and risk of breaking in the air, the Government set up an " Airworthiness of Airship Panel "—a sub-committee of the National Physical Laboratory—by which the designs of both airships were to be examined and passed.

Now that both ships are completed and undergoing their trials, it can hardly fail to be of some interest to see what the author has to say on the score of large airships.

He says " that, as a result of the last seven years' investigation and work upon the R100, I am firmly convinced that the airship enthusiasts not only over-stated their case, but failed to realize that a vessel that could neither make a landing without elaborate extraneous aid, nor be housed or rigidly secured in rough water, must always remain of doubtful value for commercial purposes."

This is a serious statement to make after all that has happened, and the money that has been spent, and one wonders how it was that, if true, Commander Burney should have allowed himself to be so easily deceived.

Yet later, when he himself had already come to the above conclusion, he confesses that, confronted with the necessity of writing some articles on airship subjects, he chose with " mixed feelings of hope and trepidation " to write them in an optimistic rather than a pessimistic vein.

Perhaps the " airship enthusiasts' " breasts had similarly been filled with hope.

Let us see what his criticisms of his own and the Government's " child " amount to—he has no doubt that his is the better of the two, as it probably is in many ways.

They are too slow—nothing under 90 m.p.h. will give reliability under the weather conditions likely to be experienced.

They are too heavy—the commercial pay-load is insufficient* and,

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* The statement is made on p. 255, that R100 has double the strength, as regards longitudinal stresses, required by the Airworthiness of Airships Panel. Small wonder that Dr. Durr, the chief designer of the Zeppelin Company, thinks that weight has been wasted in making the ship stronger than necessary.

perhaps principally, the difficulties of handling large airships with present appliances are too great.

These deficiencies are to be remedied, if another ship is to be built, again double the size of the R100 class, by:

Introducing air-cooled radial engines, and placing a proportion of them towards the rear of the airship to increase its speed;

Increasing the size and thus raising the commercial pay-load;

Altering its cross-sectional shape from roughly circular to elliptical (the major axis being horizontal), and fitting two long floats, spread well apart, running for a considerable portion of the length of the vessel, to enable the airship to alight and manœuvre on the water;

When it is necessary to place the airship in its shed, making use of a mechanical handling apparatus, termed a "Mooring and Docking Raft," although evidently intended for use on land.

That the speed of airships can be increased by alterations in the propulsive machinery seems altogether probable, since if we compare the airship with a torpedo, for example, the advantages of design seem to lie strongly with the latter.

The difficulty has always been that the tail of an airship will not carry a large weight—engine weights have to be distributed under the larger diameters of the vessel, and transmission shafts are out of the question on account of weight, although Forlanini tried long shafts in an Italian semi-rigid before the war. The advent of light-weight air-cooled engines, mounted perhaps on the fins even, would certainly alter the problem, and might undoubtedly lead to considerable increase in speed.

There will be a gain in commercial pay-load from a further increase in size, but other expenses and difficulties increase, and will the necessary support be forthcoming for another adventure of this sort until it has been proved what can be done on the present basis, viz., the 150-ton ship? Messrs. Vickers, having contributed £190,000 to the present ship, R100, leave little doubt as to their future attitude, and all that can be said is that America is understood to be building two airships of 180 tons.

The value of the elliptical cross-sectional shape, to which the author appears to attach great importance, is not so clear to those not in the author's confidence. An airship is usually made so that its cross-sectional shape corresponds approximately to the natural shape which a gasbag takes up on inflation, *i.e.*, roughly circular. The shape proposed seems to have been adopted in order to give lateral stability to the airship on the water, as it enables the floats to be spaced well apart, and reduces the overturning moment of a side-wind, and in order to obtain aerodynamic lift from the shape of the hull, when in the air.

The author in a non-technical work of this kind naturally does not give all the considerations which have led to this proposal, and no definite opinion can be expressed, except that such vessels will take up considerably more room in their sheds than the more normal type.

When it comes, however, to the proposal normally to handle large rigid airships on the water it is impossible to agree with the author.

This is the "sailor-airman's" ideal:

Land on the water, cruise under your own power to a suitable buoy

in any harbour you wish to call at, tie up, and go ashore in the nearest shore-boat.

Alas that the project is not so rosy as it sounds!

When rigid airship No. 1 (*Mayfly*) was built at Barrow-in-Furness in 1910-12, this project held the field.

The airship was even built in (or over) the water, presumably to accustom her to that element from the first.

She was floated out of her shed and tied up to a mooring post on a raft in the middle of Cavendish Dock.

We will not enter into the causes of her demise, and if no further experiments had been made, it would be fair to say that, under altered conditions, an old experience may well serve to point the way to improvement and success along the same lines.

Unfortunately, there have been many later experiments in search of this ideal, but, to put it shortly, they have all failed for one good reason, viz.:

> because you cannot run about on the water as you can on dry land, and when it comes to boat-work at night in a gale, as it does sooner or later, the weak points of the scheme reveal themselves.

The plan for the "Mooring and Docking Raft," for mechanically placing an airship in its shed on land is interesting, and if any Government could find the money to lay it down (for the next size in airships, it is presumed), it might save the cost of an occasional handling party, and would be a pleasing toy to play with. That it is dangerous, however, to hold mechanically any airship broadside on to the wind is, of course, an axiom, and the expense of the scheme would really appear to make it prohibitive.

The author's final position appears to be that, while he considers the present airships as nothing to be particularly proud about, yet he does regard them as a necessary link in the chain of evolution, and as stepping-stones to future success, provided always—and this is his chief preoccupation—that the problem of mooring and handling them can be successfully solved, either on the lines he himself suggests or on any other line.

The interest of the book to many will be the reactions of the old airship problems on a brilliant and ingenious mind, which approached them free of the trammels of any past aeronautical experience, and which was apparently misled to a certain degree by those "wicked" "airship enthusiasts."

No one, however, is ever much in contact with airship work without becoming an enthusiast, and the author is in danger himself, even now after his seven years' experience, *vide* the following proposal:

> One hundred passengers paying £200 for airship passages across the Atlantic, and a bi-weekly service with ships twice the size of the R100.

This does not sound too pessimistic an outlook somehow.

Yet, according to this book, the R100 requires at least 10 tons extra lift, and the R101 22.5 tons extra lift, to make each a commercial proposition upon the London-Egypt route at 70 m.p.h.

The mooring-mast base in Egypt is some 2,400 miles away, and an alternative, necessary in any case if a safe service is to be given, of

having another mooring-mast base half-way does not seem to have occurred to the author.

In fact, he appears to consider that the mooring-mast preparations which have been, or are being, made in India, Australia, Canada and the Cape, are premature, and that airships of the future will either land on the water, or use his mechanical device for being placed in their shed.

Needless to say, there will be considerable dissension from this point of view.

The author considers that snow is " the airship's greatest bugbear " and has some interesting things to say on this problem.

A complete solution of this problem has certainly not yet been found.

If the airship can leave the mast and fly around until the snow stops, well and good—dry snow encountered in flight does not adhere to an airship appreciably—but one feels that this is not the hoped-for or final solution of the matter.

Enough perhaps has been said on the airship material contained in the book, whilst those who wish to read bright arguments for encouraging civil aviation at the expense of the R.A.F., for combining the Air Force with the Admiralty, and much else of interest on Imperial and international relations from the air point of view, cannot do better than read these arguments for themselves, and draw their own conclusions.

INTO THE BLUE. By CAPTAIN NORMAN MACMILLAN, M.C., A.F.C. (Duckworth. 8s. 6d. net.)

THE SPIRIT WHICH MADE THE R.F.C.

This is a notable book in every way, and it tells the story of the war in the air on the Western and Italian Fronts through the personal experiences of the author with a sincerity and vivid touch. It illumines every phase of that amazing mixture of chivalry in the air, deadly pursuit of an enemy while pouring lead into him, cold-blooded concentration upon even greater efficiency and high-spirited irresponsibility on the ground which the sum total of went to make up the finest fighting force in the air the world has yet seen.

It may seem strange that we should have had to wait until eleven years after the Armistice for a story which rings true everywhere and contrives to put into proper proportion all the rapid changes which accompanied the growth of the Royal Air Force during the war period; but Captain Macmillan has exceptional gifts which enable him to combine the scientific mind which analyses its experience as it learns with the detachment of a philosopher and more than a touch of the poet able, even when patrolling high over the lines, to observe and interpret to his reader the beauty of a still, clear evening in which England, fair and unspoilt, lies peaceful across the Channel under a western sky. He conveys truly the picture of a force keeping the enemy back even while it is learning to handle its new weapon, and the spirit which inspires it even when with inferior equipment its work is being done at a heavy cost in casualties.

His analysis of his emotions before his first solo will strike a responsive echo in many a breast. There is sly humour in his remark on first joining a two-seater squadron in France that whenever a new pilot arrived all the observers who might have to fly with him came out on

the tarmac to watch his first practice landings; and as a member later of a crack fighting unit, the story of that squadron's air history even after this passage of time is packed full of practical fighting hints well worth study to-day by the newer generation. There are true incidents which read like fiction—the British machine with its tail shot away by one of our own shells, plunging out of control until by a miracle the Lewis-gun drums broke loose and, falling into the tail, gave just enough balance to enable the machine to rocket across the lines and—another miracle—crash in an old gunpit. There the wings, straddling across the top, saved the crew. "The two men got out. Physically, they were unhurt, but mentally they were wrecks. . . . They put up a gallant effort to fly again with the Squadron, but their nerves were too badly strained and they returned to England."

Or again a frightening experience which happened to the author himself. Diving on a Hun, suddenly he found an R.E.8 had slipped in between:

"I saw the wide-open mouth of the horror-struck observer. He thought that I would hit him head-on and wipe him from existence torn to fragments with the whirring engine and propeller that I carried. So did I. For a fragment of time I hung in space, mentally, already dead. The observer and I saw each other as souls already hurled into the eternal cosmos. . . . I yanked the Camel's stick hard into my stomach. . . . By a miracle we missed collision, by a miracle my Camel held together. . . . And as I went home I cursed the damn-fool of the British R.E.8."

The low-flying jobs are pictured more vividly than any description yet published. There was an element of uncertainty when the artillery barrages were intense, Captain Macmillan remarks, and if caught in the aerial tunnel of a barrage, safe exit could only be secured by flying down the centre of the tunnel:

"The different types of shells were sped from their guns at different angles and rose to varying heights, thus creating a series of superimposed tunnels through which at certain definite levels we could fly with comparative safety. The lowest tunnel was the worst and our rocking flight through it was accompanied by torn wings from flying fragments of shell and lumps of mud which bespattered our planes. The terrific buffets of air from the concussions of the exploding shells threw our little planes about in an almost uncontrollable fashion."

Then there are many passages describing air fights, and there is one showing how too great a keenness in chasing a Hun led to the author himself finding "the hot lead of a pair of Spandaus" playing around his ears. He acknowledges that he was very lucky to get out of that imbroglio alive, because his spars were holed and splintered, and gashes in the fabric opened with the wind. Captain Macmillan was then a patrol leader, and it was his main concern always to keep a watch over his junior pilots. "All above me," he says, "were my Camels reforming from the fight. Anxiously I counted them and they numbered five. Not one of my planes was missing." There is a very human touch, too, about the story of the plane which did not return after a ground strafe. The Army Corps Commander sent through a message of congratulation on the good work the Squadron had done; but all the time four mechanics stood outside one corner of the hangar disconsolate, waiting for the bus they tended and which never returned.

Incidents in the book clamour to be quoted, but it must suffice to mention a few of the lighter touches. There is the Italian Commandant who, when the Squadron crossed the Italian frontier, held up the eight military trains while he toasted and retoasted the pilots—the author dragged from a bed with a temperature, being in pyjamas and British-warm—in the station buffet; the casual warfare of the Italian Front which led to the promulgation of an official order that "troops must not hang their washing out to dry upon the barbed-wire entanglements"; and, most priceless of stories, that of a training unit returning from a very merry fancy-dress dance. One hot-head, insufficiently cooled (a delightful phrase that), ordered out his bus in the dawn. The Flight Sergeant deftly disconnected the high-tension lead as it was wheeled out, and the pilot, still with wit enough to spot the ruse, ordering its replacement and then taking off, conceiving it would be great fun to dive at the C.O.'s tent, a separate unit on the aerodrome. Of course, the inevitable happened: at the third dive he cut it too fine, missed the tent and crashed twenty feet beyond, a tangled mass of wood and wire. Here Captain Macmillan's own words cannot be bettered as a word-picture of the scene:

"Solemnly, in the morning sunlight, the group of watching dancers joined hands in a circle around the wreckage while the Flight-Sergeant and mechanics rushed over from the Flight Shed. Dressed in all manner of garments, Cowboys, Red Indians, Sailors, Persians, they danced around with glee, singing to the tune of 'Ring-a-Rosie':

"'Poor old pilot's dead,
Poor old pilot's dead,
He's killed himself;
Poor old pilot's dead.'

"Then, out of the wreck of the little scout, rose the wreck of a silk-clad Chinaman, pigtail torn from his wig-scalp, garments cut and torn.

"'You're all wrong,' he replied. 'I'm not dead.'"

It but remains to add to complete the Midsummer night's madness of the picture that the C.O. had slept right through the whole affair, and when told of it just laughed and pulled his cap a bit more over one eye.

This is a book which will live, it is one which every officer should read, and to the younger generation it will be an inspiration and a revelation of the quality which founded the Royal Air Force and enabled it, despite the depressing gaps in the Mess at night, to carry on as courageously and as light-heartedly as ever in the great adventure of the morrow.

C. G. C.

AIR DEFENCE. BY MAJOR-GENERAL E. B. ASHMORE. (Longmans, Green and Co. Price 8s. 6d.)

Perhaps no subject since the war has attracted the attention of military circles, both at home and abroad, so much as the problem of defence against aerial attack. This is somewhat surprising, when we consider how the general attitude at the end of hostilities was that local protective measures were to a large extent useless and that salvation was only to be found in the aerial counter-offensive. This view was doubtless to a certain extent fostered by the lack of any authoritative account of what

had been done in the war and what could be expected from an air defence organization, based on the experiences of that period. This book goes far to remedy this omission.

General Ashmore not only organized and commanded the defences of London during the war, but was also responsible for the reorganization of the ground units of the air defence scheme which exists at home to-day. The author is thus unique in his qualifications for writing about his subject. As a result, we have a book of real value to the student of air defence, and also one of considerable interest to the ordinary reader.

The first part of the book is devoted to the war period and to the growth of the defence organization during those eventful years. It gives a clear picture of the difficulties which confronted the authorities, and the measures taken to cope with them, often in the face of ignorant if not actually hostile criticism. Viewed in the light of history, it is a remarkable example of what has to be faced in building up an organization in the stress of war, when the problems have not been studied in peace-time and when no adequate resources of material are available. The very real measure of success achieved by the defences is clearly demonstrated. By the end of 1917 the airship menace was over. The far more difficult problem of the night-flying bomber was also eventually solved, in the sense that the last raid over England occurred in May, 1918.

This part of the book brings out clearly two fundamental principles of air defence, firstly the necessity for the co-operation of all means of air defence, both active and passive, and secondly the need for an adequate warning system.

It is often argued, and not without a certain element of truth, that the results obtained during the war were against aircraft of poor performance in comparison with the aeroplane of to-day. The second part of the book, which is devoted to a description of the methods employed in the defence scheme to-day, goes far to put this argument in the right perspective. The organization has undoubtedly made great strides since the war, and the author holds the view that this increase in efficiency has more than offset the increased performance of modern aircraft. At the same time, he strikes a note of warning, in that, if the defences are to be satisfactory, we must be fully prepared in peace-time. Hasty improvisation at the outset of hostilities is no answer to the problem.

Apart from these more or less technical considerations, there is much to interest the general reader. The fact that the Kaiser was averse to the indiscriminate bombing of London will be news to most people. The comparison of the total air-raid casualties with those caused by street accidents is significant and expressed in an amusing manner. Viewed as a whole, this book is perhaps the most valuable contribution to the subject of air defence which has yet appeared.

K. M. L.

BRITISH STRATEGY. A STUDY OF THE APPLICATION OF THE PRINCIPLES OF WAR. By MAJOR-GENERAL SIR F. MAURICE. With an Introduction by Field-Marshal Sir G. Milne. (Constable. 10s.)

Reviewed by B. H. LIDDELL HART.

" So many men, so many opinions," is a saying far from true. The thought of the mass on any subject is as standardized as a modern

motor-car. And time for thought tends to minimize the difference between the thinking, so that they become matters of degree. I do not entirely agree with the framework of " principles " on which General Maurice's new book is built; indeed, I have the feeling that he himself does not, but has adopted it as one which is sufficiently serviceable for the purposes of making his book a " useful adjunct to the study of the forthcoming edition of Field Service Regulations."

I do not agree with a number of his arguments—and sometimes I feel that they are used to assuage his own growing doubts. But I find still more to agree with. If the book falls short of being a complete or perfected study of war, it is packed with good things and good thoughts. And the falling short is not the least of its recommendations to a fellow-student of war.

One is probably within the mark in assuming that in any year one spends more hours in study and reflection on war than the normal officer on active duty spends in ten. Yet with each year of further research I feel more sure that I, or, indeed, preceding military thinkers, have but penetrated the upper strata of the subject. This consciousness of ignorance does not make for that complacency which passes for charity; it does not make one more tolerant of those who, as generals, or on general staffs, can complacently prescribe doctrines and frame plans in which thousands of lives are risked, after a minimum of self-preparation. But it does make one more appreciative of all who are continuously probing for truth, even though one differs from them.

General Maurice is the foremost representative of the conservative school of war, but he is not static, and is far from a die-hard. It is a fine confession when he says that " I am very conscious that I took before 1914 far too narrow a view of war. . . ." The evolution of his own thought is shown in many directions. For example:

> " Of those countries, the one which has given at least as much thought to the mobilization of its industries as to the mobilization of its armies will be at the greatest advantage."
>
> . . . .
>
> " The chief criticism which our descendants will have to make of our conduct of the Great War will be that we did not make the best use of our amphibious power, and in fact we first turned ourselves voluntarily into a land power, and began to think of our amphibious power afterwards."
>
> . . . .
>
> " The best course would have been to have made the forcing of the Dardanelles and the occupation of Constantinople the military object of 1915 and to have changed the policy of the Western Front to a defensive policy."

Similarly in regard to air and tank power he makes a significant advance, although caution leads him still, I feel, to compromise too much with the past. If his reasoning in " mitigation " of air power is not so convincing as elsewhere, is it perhaps because it does not really convince himself; because his thought is advancing faster than his desire?

His doubts as to the decisiveness of air action even against the " stomach " of armies, raise a further question. Justly, he interprets Napoleon's advice, " Read and reread the campaigns of the great com-

manders," to mean a broad survey of history, and then somewhat illogically says that the "student of war to-day need not go so far afield"; that "two or three campaigns" will suffice. But was not this limitation the very cause of the too narrow view of war pre-war which he admits and deplores? Even the historical examples with which he decorates his discourse are culled from a small field, and in particular show the pre-war British tendency to study the eastern side of the American Civil War without awareness of the far more decisive and prophetic war in the West.

For example, the example of Jeb Stuart, here quoted once again, leads to a disparagement of the effect of raids on communications, whereas Forrest's raids in the West yield a very different picture. Again, the West provides repeated instances of the combination of strategic offensive with tactical defensive which General Maurice regards as so rare.

I have already spoken of the "principles" which he accepts as pegs for his chapters—originally a series of lectures. Their weakness is that they were a provisional compilation by Colonel Fuller, who, after fuller thought, recast his own classification. But, having once got into Field Service Regulations, they cannot be got out. Happily, General Maurice's canvas is stronger than the pegs which hold it down. He shows the folly of a "plain, straightforward concentration" against the enemy's main forces, and the value of purposeful dispersion. He points out that, while Marlborough restored to war the "principle" of offensive action, he only "fought when he had created odds in his favour" by manœuvre and surprise. He recognizes that the political object must govern the military object.

This coincidence with the evolution of my own thought is to me both welcome and encouraging—especially his emphasis on the need "to appear to aim at one object while in reality we have another." I would, however, go farther and say that we should be ready to seize the one instead of the other. The advantage of this "variability" is the key-lesson of Sherman's strategy—in the West. It is part of the principle of "elasticity," which is more fundamental than any in Field Service Regulations.

"The Times" Trade and Engineering Supplement. Published weekly; price 3d.

The Trade and Engineering Supplement of *The Times* has a special section devoted to Aircraft once a month. This deals with military and civil subjects, gives the details of the latest machines as they become available, and in recent issues has discussed such subjects as the value of extreme speed, its influence on design, the new airships, and municipal airports.

On Alexander's Track to the Indus. By Sir Aurel Stein, K.C.I.E. 182 + xxi pp.; 97 illus.; 2 maps. (Macmillan & Co. 21s.)

It is ever a pleasure to review the work of an enthusiast. And when the enthusiast is recounting the successful issue of a long-desired task, his adventures hold the interest, whatever the theme.

Every year, a small garrison leaves India by the Malakand Pass. With the aid of an auxiliary column, it treks up the famous Chitral Road and

immures itself for a year in that far-flung fortress. The famous road is but a track leading over nullahs and through unpleasant passes in a desolate country, impoverished and war-stricken like the usual trans-frontier state.

And yet this road has interests of its own. On the literary side it is easily recognized as the " Broken Road " of A. E. W. Mason. As a matter of history, it is the road by which the great Alexander invaded India. This route may be used again. And so we find the Fortress of Chitral established but a few miles from the nearest Russian fort.

The Swat Valley had a greater importance in older times. As witness the number of ruined Buddhist temples which were as plentiful as petrol-pumps along our main roads, offering solace and refreshment to many a Chinese Buddhist pilgrim on his way to the sacred sites of Swat. Coins are dug up ranging from the times of the Indo-Greek and Indo-Scythian kings—in fact, all the dynasties which flourished up to the time of the Islamic conquests which arrested all progress for nine hundred years.

Alexander came down the Swat Valley in 327 B.C. The Assakenoi who inhabited those parts refused to give battle in the open, and showed a tendency to get bottled up in strong positions. After several Greek victories, the survivors were huddled up on a mighty mass of rock called Aornos, which even Herakles had found impregnable. This challenge to his renown fired Alexander, and he captured this strong point.

Sir Aurel Stein's ambition had been for years to follow these later marches of Alexander, and identify modern villages with the old battle sites. In particular, he wished to prove his idea that a rock *massif* called Pir-Sar, which he had studied from afar from the farther side of the Indus, was actually Aornos.

And so he takes the reader on a long trek from Peshawar through the Malakand Pass and then up the Swat Valley. The times were propitious, the tribes being held together by a powerful and friendly chieftain. The wealth of archæological remains was found to be great. Sir Aurel spends a day here and a week there, looking for remains of forts, and questioning the " oldest inhabitant " as to the legends of the district. Hearsay evidence was absent. The hand of Islam had wiped out history.

And then he arrives at Pir-Sar. The measurement of the plateau, the dimensions of a ravine that had to be bridged, its position in regard to the Indus, all correspond. After Alexander's victory, he left a fortified post. The ruins are there. And so, step by step, the obliterating effect of nine centuries of Islam is removed. Sir Aurel makes the past live and the present vivid. The reviewer's only complaint is that Sir Aurel was not his fifth-form master.

H. E. H. T.

THE ASSYRIANS AND THEIR NEIGHBOURS. By the Rev. W. A. WIGRAM. 247 pp.; 8 illus.; 1 map. (G. Bell and Sons. 15s. net.)

The Rev. Wigram has given us yet another book on the Assyrians. But he has not confined himself to his *protégés*. " And their Neighbours means the difficult task of giving a bird's-eye view of all the other races that make up Iraq.

It is the Assyrian stock that he is interested in. Other races have their day of power, and it is their impact on this ancient unit which makes this book. The Assyrian is the only stock that has remained in

Mesopotamia from the earliest times, the previous Mongolian Sumerians having quite disappeared.

So, introducing us to the Assyrians in 2000 B.C., the author gives a short but clear account of the conquests of Iraq by Parthian, Greek, Roman, Persian and Arab in turn. The Assyrian was converted to Christianity early in the history of the Church, the first bishop being consecrated in A.D. 104. From that time onward, their history is one of a varying amount of persecution.

Dr. Wigram makes it very clear that the setbacks of the early Churches were due entirely to their lack of cohesion. The Greek Church refused to have any truck with the Armenians when the Moslem threat was written in the sky. Their reward is written in the fact that Stamboul is Mohammedan to-day.

The Assyrian Church suffered alike from schisms and was split into remnants in the days of the Tartar invasion. But in the hills and lake-lands the faithful few crouched guarding their relics, and when the Ottoman Empire was established had won respect, position, and fleeting periods of safety.

Persecutions recurred, however, and their position seemed hopelessly that of the permanent underdog. The " Young Turk " reforms did not help. The far provinces were still run by the old *régime*.

Dr. Wigram breaks his narrative at this point to give a description of this granite nation at the outbreak of the Great War. They declared for the Allies, a bold gesture which does not seem to have brought its reward.

Disappointed in Russian aid, the remnants of the nation found themselves blockaded in an inhospitable tableland. They broke through to Persia and safety, but lost all grip of their native soil.

Left again in the air by the break-up of Russia, they were fighting to a finish at Urmi. A flying British column got within 150 miles. An R.A.F. officer visited with promises of support if they could only hold out. But supplies were running short. The Assyrians essayed a movement towards the south, and as soon as they left their defences the Turks attacked and carried the position.

Then followed a trek to the southward of seventy thousand people, of whom half perished on the way. The remainder were lodged by the British at Baqubah, forty miles north of Baghdad.

The multifarious problems of pasture settlements postponed any definite scheme of repatriation. Their post-war services as Levies are well known. Here are a brave race, desiring to live under British rule, but having no territorial claims on land in a British sphere of influence. What is their future? On this question-mark Dr. Wigram ends this interesting sidelight on Iraq.

H. E. H. T.

EGYPT IN SILHOUETTE. By TROWBRIDGE HALL. 278 + xix pp.; 25 illus.; 1 map. (The Macmillan Company, New York. Price 15s.)

The author of " Egypt in Silhouette " has evidently specialized in travel books concerning widely separated countries. The book, therefore, must be judged from a would-be tourist's point of view. It is less informative but more atmospheric than a guidebook. But the atmosphere has, one feels, been grabbed by a hastily passing hand.

This small volume will, doubtless, bring the glamour of the East to the fireside of the West more certainly than the book of an Eastern scholar. Some superficiality of treatment is due to the attempt to give in such short space an account of the land of to-day, of its fables and history, its present political and economic problems, topping off with a survey of its modern literature, which occupies some seventy pages.

In his early pages, the author reminds us that the scenes of the Old Testament can be seen or reconstructed to-day. At Alexandria, he touches lightly on fair women. Cleopatra, Thais and Hypatia are dismissed somewhat shortly. But others have arranged their immortality.

A brief account of the scenes of the Delta and our author dashes to Cairo. A passing view of this and we are given a chapter on Islam, the author taking his hearers to a service within a mosque.

He then gives a dissertation on the emancipation of woman which does not bear the mark of personal knowledge. He maintains that women in Turkey remained veiled until 1923. This is quite incorrect. The reviewer met many Turkish ladies in Baghdad in 1921 and 1922 who regretted having to reassume the veil, which they had discarded in Stamboul.

The picture of Cairo is rounded off with many of the picturesque legends that are attached to the mosques of the city, and then the Sphinx and Memphis are visited in turn. Assiut introduces the Copts, Abydos and Denderah recall the days of the Pharaohs. And so through Luxor and Karnak to Assuan and Abou Simbel. A brief description, some well-retold legends and excellent photographs make all these tourist resorts desirable.

And then the author flits away to Khartoum and the Sudan. The latter name (the black people = es sudan) fails to make him understand that he is no longer in Egypt. After a brief tribute to Gordon, he endeavours to sum up the Egyptian grievance *re* the Sudan, and fails. He suggests that Zaghlul's demand for full Egyptian sovereignty over the Sudan gained force because it was made when the world was still ringing with President Wilson's "gospel of self-determination." Surely this gospel did not mean placing the African Sudanese under the Asiatically sprung Egyptian.

The last section of the book is given up to examples of modern Egyptian literature. Many short stories and poems are printed in full. Those who are interested in the modern Egyptian people will find this the most interesting part of the book. As may be expected in an Eastern people, the poetry far outshines the prose.

The twenty-seven illustrations of the book are admirable and well-chosen photographs.

H. E. H. T.

AFGHANISTAN FROM DARIUS TO AMANULLAH. By LIEUT.-GENERAL SIR GEORGE MACMUNN, K.C.B., K.C.S.I., C.B., C.S.I., D.S.O. 359 pp. and 24 illus; 9 maps (one coloured). (G. Bell & Sons. 21s. net.)

Successful soldier, keen ethnologist and lucid writer, Sir George MacMunn is especially fitted to deal with the interesting collection of peoples known as Afghans. The avowed intention of this book is to

destroy the popular conception of Afghanistan as a country of dreams, Tibet-like in its mystery and isolation.

The various failures of our policies have drawn a veil of mystery in front of the Khyber Pass and the Sulaiman Mountains, and history has never made it clear that Kandahar and Delhi were for centuries two poles of the same empire. Since the Aryan invasion, India and Afghanistan have been politically, geographically and racially one and indivisible.

To make this clear, Sir George MacMunn commences his tale with a brief account of the Persian and Greek invasions of those regions, and, after a brief survey of the military geography and racial origins of the country, brings us to the year A.D. 1000 when the Indus might be said to form a barrier between Islam and Hinduism.

The next seven hundred years were one long story of religious warfare and royal intrigue. The rulers of Kandahar and Herat only ceased harrying the plains of Hindustan when Persian pressure drew their eyes to the north. Finally, in 1747, Ahmed Shah seized and united all the provinces north of the Indus, and Afghanistan as a nation was born. Ahmed Shah harried India repeatedly, the usual quarrel between Hindu and Moslem affording him a divided foe. It was the shattered remnants of the Mogul Empire that the British gathered up.

The nineteenth century saw the British enter Afghanistan on several occasions, but never with an idea of extending British rule into those regions.

General MacMunn makes the motives of the political officers very clear, and claims that the reigns of Abdurrahman and Habibullah proved the wisdom of their policy.

The rigid adherence of Habibullah to his friendship with Great Britain was remarkable. Every possible inducement and threat was employed to make him alter his attitude. In all the frontier disturbances of 1915 the rumour of his death was repeatedly cropping up. It was noticeable that everybody, British and Indian alike, took it for granted that his disappearance from the throne would mean an instant invasion of the Indian frontier by Afghans.

But he lasted till January, 1919. And in ten years his successor has made as many mistakes as was humanly possible. A war on India—a peace with England—a Western tour, and then the plunging of his kingdom again into bloodshed.

General MacMunn has made the history of the last century come to life again. The politician or soldier alike will appreciate the fairness of his comments. Also will an account of the bloodthirsty peoples who live within a ride of Peshawar be useful to the owners of the Geneva complex, and the admirers of " Dominion Status."

H. E. H. T.

BOOKS RECEIVED

AIR.

SPEED. By T. S. DENHAM. (The Pilot Press. 3s. 6d.)

THE ART OF FLYING. By CAPTAIN NORMAN MACMILLAN. (Duckworth. 5s.)

LEARNING TO FLY. By FRANK A. SWOFFER. (Sir Isaac Pitman & Sons, Ltd. 7s. 6d. net.)

AEROBATICS. By MAJOR OLIVER STEWART, M.C. (Sir Isaac Pitman & Sons, Ltd. 5s. net.)

AEROPLANES, SEAPLANES, AND AERO ENGINES. By P. H. SUMNER. (Crosby, Lockwood & Son. 25s. 9d.)

BIOGRAPHIES.

BIOGRAPHY OF THE LATE MARSHAL FOCH. By MAJOR-GENERAL SIR GEORGE ASTON. (Hutchinsons. 24s.)

MILITARY.

GENERALSHIP OF ULYSSES S. GRANT. By COL. J. F. C. FULLER. (Murray. 21s. net.)

WAR.

THE DECISIVE WARS OF HISTORY. By CAPTAIN B. H. LIDDELL HART. (Bell. 12s. 6d. net.)

THE INDECISIVENESS OF MODERN WAR. By J. HOLLAND ROSE. (Bell. 10s. 6d. net.)

CONTEMPORARIES

The Army Quarterly.
Canadian Defence Quarterly.
Cavalry Journal.
Fighting Forces.
The Halton Magazine.
The Hawk.
Household Brigade Magazine.
Journal of the Royal Air Force College.
Journal of the Royal Aeronautical Society.
Journal of the Royal United Service Institution.
Journal of the United Service Institution of India.
The Planesman.
The Royal Army Service Corps Quarterly.

ROYAL AIR FORCE SPORT.

FIXTURES, JANUARY—MARCH, INCLUSIVE.

Sat.	Jan.	4	Rugby ...	R.A.F. v. The Police, at Imber Court.
Wed.	,,	8	Football ...	R.A.F. *v.* Middlesex, at Uxbridge.
Wed.	,,	8	Hockey ...	R.A.F. *v.* Royal Engineers, at Uxbridge.
Thurs.	,,	9	Football ...	R.A.F. *v.* F.A. XI, at St. Albans.
Fri.	,,	10	Boxing ...	R.A.F. *v.* Civil Service, at Stadium Club.
Sat.	,,	11	Hockey ...	R.A.F. *v.* Southgate, at Southgate.
Wed.	,,	15	Hockey ...	R.A.F. *v.* Bedford County, at Bedford.
Wed.	,,	15	Rugby ...	2nd Round, Inter-Unit Challenge Cup Competition, 1929-1930.
Sat.	,,	18	Football ...	R.A.F. *v.* Corinthians, at Crystal Palace.
Sat.	,,	18	Rugby ...	R.A.F. *v.* Bristol, at Bristol.
Mon.	,,	20	Fencing ...	R.A.F. *v.* I.C.U., at Uxbridge.
Wed.	,,	22	Hockey ...	R.A.F. *v.* Civil Service, at Stanmore.
Wed.	,,	22	Rugby ...	R.A.F. *v.* Cambridge University, at Cambridge.
Fri.	,,	24	Fencing ...	R.A.F. *v.* Tassarts, at Salle Tassart.
Sat.	,,	25	Rugby ...	R.A.F. *v.* Northampton, at Northampton.
Tues.	,,	28	Squash Rackets	R.A.F. Club *v.* Cavendish Club.
Wed.	,,	29	Fencing ...	R.A.F. *v.* U.I.F.C., at Bertrand's.
Wed.	,,	29	Hockey ...	R.A.F. *v.* Oxford University, at Oxford.
Wed.	,,	29	Skating ...	R.A.F. Initial Championships for Skating, at Maloja, Switzerland.
Wed.	,,	29	Cross-Country	Triangular Cross-Country Match with Middlesex County and Civil Service, at Ickenham.
Thurs.	,,	30	Ski-ing ...	R.A.F. Initial Championships for Ski-ing, at Maloja, Switzerland.
Thurs.	,,	30	Rugby ...	R.A.F. *v.* Leicester, at Leicester.
Mon.	Feb.	3	Fencing ...	R.A.F. *v.* Oxford, at Oxford.
Wed.	,,	5	Hockey ...	R.A.F. *v.* Essex.
Wed.	,,	5	Squash Rackets	Conservative Club *v.* R.A.F. Club.
Thurs.	,,	6	Boxing ...	R.A.F. *v.* Aldershot Command.
Fri.	,,	7	Fencing ...	R.A.F. *v.* Royal Navy, at Uxbridge.
Sat.	,,	8	Rugby ...	R.A.F. *v.* Royal Navy, at Twickenham.
Sat.	,,	8	Hockey ...	R.A.F. *v.* Tulse Hill, at Kent House.
Wed.	,,	12	Football ...	R.A.F. *v.* Civil Service, at Chiswick.
Wed.	,,	12	Hockey ...	R.A.F. *v.* The Army, at Beckenham.
Wed.	,,	12	Rugby ...	R.A.F. *v.* Middlesex.
Thurs.	,,	13	Fencing ...	R.A.F. *v.* Cambridge, at Bertrand's.
Thurs.	,,	13	Squash Rackets	R.A.F. Club *v.* Queen's Club.
Fri.	,,	14	Fencing ...	R.A.F. *v.* Bertrand's, at Bertrand's.
Wed.	,,	19	Rugby ...	3rd Round, Inter-Unit Challenge Cup Competition, 1929-1930.
Wed.	,,	19	Hockey ...	R.A.F. *v.* Middlesex.
Wed.	,,	19	Squash Rackets	R.A.F. Club *v.* R.A.C.
Fri.	,,	21	Fencing ...	R.A.F. *v.* Tassarts, at Salle Tassart.
Fri.	,,	21	Boxing ...	R.A.F. *v.* Oxford, at Halton.
Sat.	,,	22	Football ...	R.A.F. *v.* Wycombe Wanderers, at High Wycombe.
Wed.	,,	26	Hockey ...	R.A.F. *v.* Royal Navy.
Wed.	,,	26	Skill-at-Arms	R.A.F. College *v.* R.M.A., at Woolwich.
Wed.	,,	26	Hockey ...	R.A.F. College *v.* R.M.A., at Woolwich.
Wed.	,,	26	Rugby ...	R.A.F. *v.* Oxford University, at Halton.
Thurs.	,,	27	Squash Rackets	Bath Club *v.* R.A.F. Club.
Fri.	,,	28	Fencing ...	2nd Round, Inter-Unit Competition.
Tues.	March	4	Boxing ...	R.A.F. College *v.* R.M.A., at Cranwell.
Wed.	,,	5	Rugby ...	Semi-Final, Inter-Unit Challenge Cup Competition, 1929-1930.
Th. & Fri.	,,	6-7	Boxing ...	R.A.F. Individual Championships, at Halton.
Fri.	,,	7	Fencing ...	R.A.F. *v.* Sabre Club, at Bertrand's.

Sat.	March 8	Hockey ...	R.A.F. College *v.* R.M.C., at Sandhurst.
Sat.	„ 8	Rugby ...	R.A.F. *v.* Coventry, at Coventry.
Wed.	„ 12	Rugby ...	R.A.F. *v.* Civil Service, at Halton.
Fri.	„ 14	Fencing ...	R.A.F. *v.* Lensbury Club, at Lensbury Salle.
Sat.	„ 15	Football ...	R.A.F. *v.* The Army, at Homerton.
Wed.	„ 19	Fencing ...	R.A.F. *v.* The Army, at Aldershot.
Thurs.	„ 20	Fencing ...	Inland Area Competition.
Fri.	„ 21	Fencing ...	Inland Area Competition.
Sat.	„ 22	Rugby ...	R.A.F. *v.* The Army, at Twickenham.
Wed.	„ 26	Hockey ...	Unit Tournament Semi-Final.
Wed.	„ 26	Rugby ...	Final, Inter-Unit Challenge Cup Competition, 1929-1930.
Wed.	„ 26	Cross-Country	R.A.F. Cross-Country Championships.
Thurs.	„ 27	Fencing ...	R.A.F. *v.* R.A.C., at R.A.C.
Thurs.	„ 27	Boxing ...	I.S.B.A. Championships, at Stadium Club.
Thurs.	„ 27	Fencing ...	A.D.G.B. Inter-Unit Competition.
Fri.	„ 28	Fencing ...	A.D.G.B. Inter-Unit Competition.
Sat.	„ 29	Football ...	R.A.F. *v.* R.N. and R.M., at Millwall.

Results

RUGBY.

R.A.F. COLLEGE, CRANWELL, *v.* R.M.C., SANDHURST.

The annual match between the Royal Air Force College and the Royal Military College was played at Sandhurst on Saturday, November 9th, when Sandhurst won by 2 goals and 2 tries (16 points) to a penalty goal and 3 tries (12 points).

As the score indicates, play was very close all through, and the game from start to finish was contested at a very fast pace.

R.A.F. College.—G. Morrison; R. Hodgkinson, H. Barnes, A. Coote and Walker; Elsmie and Bader; McKechnie, Daubeny, R. Wallace, J. C. Robinson, Coslett, de Pencier, Sawyer and Oliver.

R.A.F. COLLEGE, CRANWELL, *v.* R.M.A., WOOLWICH.

This match was played at Cranwell on November 16th and resulted in a draw, Woolwich scoring 2 tries (6 points) and Cranwell 1 try and a penalty goal (6 points).

R.A.F. College.—P. B. Coote; G. R. A. Elsmie, O. R. S. Bader, W. N. McKechnie and R. L. Wallace; C. E. J. Baines and N. C. Walker; J. O. W. Oliver, F. C. Daubeny, T. N. Coslett, W. H. Hodgkinson, W. Sawyer, E. A. de Pencier, M. W. S. Robinson and N. E. Morrison.

ASSOCIATION FOOTBALL.

R.A.F. COLLEGE, CRANWELL, *v.* R.M.A., WOOLWICH.

This match, played at Cranwell on November 16th, resulted in a win for the "Shop" by 3 goals to 2.

ROYAL AIR FORCE BOXING ASSOCIATION.

SIR CHARLES WAKEFIELD TOURNAMENT.

Held at Henlow in October, 1929.

Twenty-four teams were represented, including seven Officer Teams and six Airmen Teams among Senior Stations, and eleven Junior Teams (stations under 500). The points gained by the first three in each section were :—

Officers.		*Airmen (Senior).*		*Airmen (Junior).*	
Digby ...	25 points.	Halton ...	33 points.	Digby	39 points.
Netheravon ...	17 „	Henlow ...	31 „	Worthy Down	34 „
Sealand ...	16 „	Uxbridge ...	25 „	Gosport ...	31 „

[Photo : Gale & Polden, Ltd.

R.A.F. Representative XI.

Back Row.—**F./O. Sugden (Hon. Sec.). Sergt. Acquarroff. Cpl. Pond. Sergt. Saunders. P./O. Rowley. Flt./Sergt. Snelling. Cpl. Robinson. L.A.C. James. R. Goffin (Trainer). Cpl. Baldwin. S.M. Anderson.**
Seated.—**A.C. Cooker. A.C. Kelly. Flt.-Lieut. Hadley (Captain). A.C. Parish. A.C. Shellis.**

The R.A.F. Officers boxed their first match of the season against Cambridge University, and won by 9 events to 5. The feature of the evening was the excellent form shown by P./Off. Lord Douglas Hamilton (Upavon), F./Off. McLean (Henlow), and P./Off. Williams (Digby).

For the Team Championships no fewer than twenty-five stations have entered, the draw for which is given below :—

Junior Division.—Digby *v.* Shrewsbury ; Eastchurch *v.* Kenley ; Gosport *v.* Tangmere ; Worthy Down *v.* School of B.T., Salisbury ; Grantham *v.* Sealand ; Farnborough *v.* Old Sarum ; Calshot *v.* Lee-on-Solent ; bye, North Weald.

Senior Division.—Manston *v.* Netheravon.—Byes : Cranwell, Henlow, Uxbridge.

R.A.F. GOLF ASSOCIATION.

R.A.F. WINTER MEETING.

The Royal Air Force Golf Association Winter Meeting was held on the Trent Park course at Barnet on November 27th when H.R.H. The Prince of Wales won the prize for the best score for nine holes in the second handicap division. Squadron-Leader C. H. Hayward won the scratch prize with a score of 72.

The leading scores were :—

Scratch.—Squadron-Leader C. H. Hayward, 72 ; Squadron-Leader Barr-Sim, 75.

Handicap (*First Division*).—Squadron-Leader A. Lees, 77—8=69 ; Air Commodore Holt, 79—10=69. Lees won first prize by virtue of his better inward half.

Handicap (*Second Division*).—Air Commodore Freeman, 91—22=69 ; Flight-Lieut. Lambie, 81—11=70 ; Squadron-Leader Sir P. Sassoon, 83—12=71 ; Group-Captain The Prince of Wales, 84—12=72.

Nine Holes (*First Division*).—Air Commodore Holt, 39—5=34.

Nine Holes (*Second Division*).—Group-Captain The Prince of Wales, 40—6=34.

Four-Ball Competition v. Bogey.—Air Commodore Warrington-Morris and Flight-Lieut. Johnson, 5 up.

INTER-SERVICES RESULTS, 1929.

R.A.F. *v.*	Cricket.	Assoc. Football	Rugby.	Hockey.	Fencing.	Golf.	Water Polo.
The Royal Navy ...	Draw	R.A.F.	R.N.	R.N.	R.A.F.	R.A.F.	Draw
The Army	Army	Army	Army	Draw	R.A.F.	Army	Draw

INTER-SERVICES TRIANGULAR CONTESTS.

RESULTS, 1929.

Sport.	*1st.*	*2nd.*	*3rd.*
Athletics	Army.	R.A.F.	R.N.
Cross-Country	R.A.F.	Army.	R.N.
Tennis	R.N.	Army.	R.A.F.
Boxing	Army.	—	—
Swimming	Army.	R.N.	R.A.F.
Squash Rackets	Army.	R.A.F.	R.N.

INTER-COLLEGIATE CONTESTS.

RESULTS OF MATCHES, 1929.

R.A.F. College *v.*	Cricket.	Assoc. Football.	Rugby.	Hockey.	Fencing.	Boxing.
R.M.A., Woolwich ...	Draw	R.M.A.	Draw	—	R.A.F.C.	R.M.A.
R.M.C., Sandhurst ...	—	—	R.M.C.	R.M.C.	—	R.M.C.

TRIANGULAR CONTEST.

ATHLETICS.

R.M.C., 1. R.A.F.C., 2. R.M.A., 3.

INTER-UNIT COMPETITIONS.

RESULTS, 1929.

Association Football.	Athletics.			Boxing.	Cross-Country.
	King's Cup.	Air Council Cup.	A.D.G.B. Cup.		
Open : Henlow *Junior :* Larkhill	Henlow	Gosport	Tangmere	*Open :* Henlow *Junior :* Worthy Down	*Senior :* Henlow *Junior :* Shrews-bury

Shooting.

C.A.S.'s Cup.	Command Cup.	Nobel Challenge Cup.	Salmond Cup.	Brooke-Popham Steele Cup.
Eastchurch	Inland Area	R.A.F. College, Cranwell	Eastchurch	201 (F.B.) Sqn.

Hockey.	Rugby.	Tennis.	Swimming.
Senior : Henlow *Junior :* Felixstowe	Henlow	*Inter-Station Doubles :* Halton	*Inter-Unit Relay Race :* Henlow *Inter-Unit Water Polo :* Manston & Digby, draw

ROYAL AIR FORCE RIFLE ASSOCIATION.

MINIATURE RIFLE LEAGUE.

THE NOBEL CHALLENGE CUP.

1. R.A.F. College, Cranwell (The Nobel Challenge Cup and 10 Silver Medals) :—

F./Lieut. H. McL. Reid	98	100	198	
A.C. A. C. Hale	98	99	197	
L.A.C. W. W. Hall	97	99	196	
A.C. J. T. Armstrong	96	99	195	
A.C. F. W. Hawker	97	98	195	
Cpl. J. W. Scudder	97	95	192	
Sergt. H. T. Inglis	96	96	192	
L.A.C. R. Barker	94	97	191	—1556

Reserves : A./Sergt. R. G. Miller, 99—91—190 ; P.O. M. Lowe, 94—79—173.

Average per member : 96.625 Deliberate, 97.875 Rapid ; team average, 194.5.

Captain of team : F./Sergt. H. Tostevin.

2. R.A.F. Depot, Uxbridge (10 Bronze Medals) :—

Wing-Comdr. A. T. Whitelock	98	99	197	
Cpl. F. C. Levis	95	94	189	
L.A.C. J. Chocketts	97	92	189	
L.A.C. C. E. Gurgenven	93	95	188	
Cpl. J. Armstrong	98	88	186	
F./Sergt. F. Lucas	92	92	184	
F./Lieut. E. H. Hooper	92	90	182	
F./Sergt. H. Snelling	95	87	182	—1497

Reserves : Cpl. G. Raven, 90—91—181 ; Sergt. G. H. Bell, 86—94—180.

Average per member : 95 Deliberate, 92.125 Rapid ; team average, 187.125.

Captain of team : Wing.-Comdr. A. T. Whitelock.

3. No. 2 Flying Training School, Digby (10 Bronze Medals).

The above unit was awarded third place on account of their having made the highest score of any team in the second stage other than the finalists.

The standard of shooting throughout the League showed a vast improvement over last year. The number of teams entered was fifty, being nine more than in 1927-28.

Wing Commander A. T. Whitelock, R.A.F. Depot, won the Society of Miniature Rifle Club's Silver Medal for having scored the greatest number of points in the second stage, *i.e.*, 787 points out of a possible 800; averaging 98·375 per practice.

R.A.F. RIFLE MEETING.

The Royal Air Force Rifle Association's Ninth Annual Meeting was held at Bisley from June 3rd to 8th. The competitions were held throughout the week under adverse weather conditions, the wind being erratic and

visibility at times poor. There were some 250 competitors to shoot for twelve challenge cups, in individual and team matches, with rifle, automatic pistol and revolver.

RESULTS OF THE NINTH ANNUAL MEETING, BISLEY, JUNE 3RD—8TH, 1929.

1. REVOLVER XX CUP.—Winner of 1st Stage, Sergt. A. Worden, A. & G.S., Eastchurch (R.A.F.R.A. Bronze Medal); score, 263 (4 points over last year's winner).

2. R.A.F. RIFLE CHAMPIONSHIP.—Winner of 1st Stage, F./Lieut. S. Wallingford, R.A.F. Base, Calshot ("Grant-Dalton" Cup, R.A.F.R.A. Bronze Medal); score, 172 (3 points over last year's winner). 2nd, P./Off. A. Binley, No. 2 F.T.S., Digby (R.A.F.R.A. Bronze Medal); score, 167.

3. TYRO CHAMPIONSHIP.—Winner, Sergt. A. Bristow (A. & A.E.E., Martlesham Heath ("Longcroft" Cup, R.A.F.R.A. Silver Medal and £2); score, 104 (1 point over last year's winner). 2nd, Sergt. Kirby, R.A.F., Halton (R.A.F.R.A. Bronze Medal and £1); score, 101 (3 points over last year). 3rd, F./Off. H. Piper, No. 26 (A.C.) Squadron, Catterick (12/6); score, 98.

4. YOUNG AIRMEN'S CHAMPIONSHIP.—Winner, P./Off. A. Binley, No. 2 F.T.S., Digby ("Whitelock" Cup, R.A.F.R.A. Small Silver Medal and £2); score, 167 (11 points over last year's winner). 2nd, P./Off. Elliott, No. 504 (Ulster) (B) Squadron, Aldergrove (R.A.F.R.A. Small Bronze Medal and £1 10s.); score, 159. 3rd, A.C.2 S. Mansell, M.A.E.E., Felixstowe (£1); score, 159.

5. RIFLE CHAMPIONSHIP.—Match I: 1st, L.A.C. W. Hall, R.A.F. College, Cranwell (£2); score 44. 2nd, F./Lieut. G. R. Stainforth, R.A.F. Base, Calshot (£1 10s.); score, 44. 3rd, L.A.C. Boucher, No. 5 F.T.S., Sealand (£1); score, 44. Match II: 1st, F./Off. J. Armour, C.F.S., Wittering (£2); score, 45. 2nd, Sqdn./Ldr. H. Stewart, R.A.F., Manston (£1 10s.); score, 43. 3rd, L.A.C. Williams, No. 3 F.T.S., Grantham (£1); score, 43. Match III: 1st, P./Off. A. Binley, No. 2 F.T.S., Digby (£2); score, 42. 2nd, L.A.C. C. C. Jackson, A. & A.E.E., Martlesham (£1 10s.); score, 42. 3rd, A.C.1 Hands, No. 5 F.T.S., Sealand (£1); score, 40. Match IV: 1st, Sergt. A. Arrow, R.A.F. Base, Gosport ("Burge" Snapshooting Cup and R.A.F.R.A. Small Silver Medal and £2); score, 48. 2nd, F./Lieut. W. J. G. Walker, A. & G.S., Eastchurch (R.A.F.R.A. Small Bronze Medal and £1 5s.); score, 47. 3rd, S.M.2 Garner, R.A.F. Base, Calshot (£1 5s.); score 47.

6. THE "F. C. HALAHAN" RIFLE XX CUP.—Winner, Cpl. G. Willott, A. & G.S., Eastchurch (The Cup, R.A.F.R.A. Large Silver Medal and £3); score, 145 (1 point over record, 9 points over last year's winner). 2nd, F./Lieut. S. Wallingford, R.A.F. Base, Calshot (The R.A.F.R.A. Large Bronze Medal and £2); score, 145. 3rd, F./Off. H. H. Ellison, No. 502 (Ulster) (B) Squadron, Aldergrove (£1); score, 142.

7. THE "F. C. HALAHAN" PISTOL CUP.—Winner, A.V.-M. F. C. Halahan, H.Q., R.A.F., Cranwell (The Cup, N.R.A. Bronze Medal, R.A.F.R.A. Large Silver Medal and £3); score, 57. 2nd, Sergt. R. G. Miller, R.A.F. College, Cranwell (The R.A.F.R.A. Large Bronze Medal and £2); score, 56. 3rd, F./Lieut. S. Wallingford, R.A.F. Base, Calshot (£1); score, 56.

8. THE "BARTON" REVOLVER CUP.—Winner, F./Lieut. C. W. Hill, H.A.D., Henlow (The Cup, R.A.F.R.A. Large Silver Medal and £3); score, 175. 2nd, A.V.-M. F. C. Halahan, H.Q., R.A.F., Cranwell (The R.A.F.R.A. Large Bronze Medal and £2); score, 173. 3rd, Cpl. C. Willott, A. & G.S., Eastchurch (£1); score, 168.

9. THE "CHIEF OF THE AIR STAFF'S" CUP.—Winner, Armament and Gunnery School, Eastchurch (The Cup, R.A.F.R.A. Large Silver Medal and 9 Small Silver Medals); score, 1207 (81 over last year's winners). 2nd, No. 3 Flying Training School, Grantham (The R.A.F.R.A. Large Bronze Medal and 9 Small R.A.F.R.A. Bronze Medals); score, 1135 (9 points over last year's winner).

10. THE "BROOKE-POPHAM-STEEL" SQUADRON RIFLE TEAM CUP.—Winners, No. 201 (Flying Boat) Squadron, R.A.F., Calshot (The Cup, the R.A.F.R.A. Large Silver Medal and 4 Small R.A.F.R.A. Silver Medals); score, 515 (20 points over last year's winners). 2nd, No. 32 (Fighter) Squadron, Kenley (The R.A.F.R.A. Large Bronze Medal and 4 Small R.A.F.R.A. Bronze Medals); score, 490.

11. THE "SALMOND" PISTOL TEAM CUP.—Winners, Armament and Gunnery School, Eastchurch (The Cup, The R.A.F.R.A. Large Silver Medal and 4 Small R.A.F.R.A. Silver Medals); score, 199. 2nd, Royal Air Force College, Cranwell (The R.A.F.R.A. Large Bronze Medal and 4 Small Bronze Medals); score, 187.

12. The R.A.F. Rifle Championship and Grand Aggregate.—Winner, F./Lieut. S. Wallingford, R.A.F. Base, Calshot (The "Duke of Sutherland's" Challenge Cup, The N.R.A. Silver Medal, The R.A.F.R.A. Large Bronze Medal and £5); score, 331 (2 points over last year's winner). 2nd, F./Lieut. G. H. Stainforth, M.A.E.E., Felixstowe (The R.A.F.R.A. Large Bronze Medal and £3); score, 322. 3rd, L.A.C. O. H. McNair, No. 3 F.T.S., Grantham (£2); score, 320. 4th, F./Off. J. Armour, C.F.S., Wittering (£1); score, 317. 5th, F./Lieut. C. Hatcher, M.A.E.E., Felixstowe (£1); score, 314. 6th, F./Lieut. C. W. Hill, H.A.D., Henlow (£1); score, 307. 7th, F./S. F. H. Ford, R.A.F., Halton (£1); score, 306. 8th, Sergt. A. Arrow, R.A.F. Base, Gosport (£1); score, 306.

THE R.A.F. COMMAND CUP, 1929.

Winners, Inland Area Command, Great Britain (The R.A.F.R.A. Command Cup, a replica of same and 9 R.A.F.R.A. Silver Medals); score, 1265. 2nd, Royal Air Force, Middle East, Egypt (9 R.A.F.R.A. Bronze Medals; score, 1251.) 3rd, Coastal Area, Great Britain; score, 1135. 4th, R.A.F., Halton, Great Britain; score, 1098. 5th, R.A.F. College, Cranwell; score, 1076. 6th, R.A.F., India; score, 1021. 7th, Fighting Area, Great Britain; score, 958. 8th, R.A.F., Iraq; score, 917. 9th, R.A.F., Malta; score, 806.

INTER-SERVICES MATCHES.

1. The United Services (Rifle VIII) Challenge Cup.

(Captain of Team: F./Lieut. J. W. Lissett)

F./Lieut. G. H. Stainforth	174
F./Lieut. C. W. Hill	147
L.A.C. O. H. McNair	146
F./Lieut. Walker	146
L.A.C. Hall	144
Cpl. Willott	142
F./Sergt. B. Crane	142
F./Sergt. F. H. Ford	142
Total	1183

Fourth place. Five teams entered.

Regular Army	1358
Royal Navy	1300
Royal Marines	1213
Territorial Army	1151

2. The "Whitehead" (Revolver VIII) Challenge Cup.

(Captain of Team: A.V.-M. F. C. Halahan)

F./Lieut. G. H. Stainforth	88
F./Lieut. C. W. Hill	87
A.V.-M. F. C. Halahan	85
F./Off. Mackenzie	80
Sergt. Miller	78
Cpl. Willott	77
Sergt. Worden	76
F./Lieut. Staton	73
Total	644

Third place. Four teams entered.

Regular Army	671
Royal Navy	653
Royal Marines	628

3. **Inter-Services' XX Match (Rifle).**

(Captain of Team : A.V.-M. F. C. Halahan)

(Coach of Team : Wing-Comdr. A. T. Whitelock.)

Cpl. C. H. Sexton	136
A.C. Paul	134
S.M. A. E. Taylor	134
F./Lieut. C. J. W. Hatcher	133
Cpl. C. C. Willott	132
L.A.C. W. Hall	131
F./Lieut. E. C. Delamain	130
F./Lieut. C. W. Hill	129
F./Off. H. H. Ellison	128
Wing-Comdr. J. K. Wells	128
L.A.C. O. H. McNair	128
Sergt. A. Worden	126
F./Lieut. J. G. W. Walker	125
S.M. C. Spry	124
Sqdn./Ldr. E. B. C. Betts	122
Sergt. D. Edwards	122
S.M. B. Earl	122
F./Sergt. F. H. Ford	121
A.C. E. King	119
F./Sergt. B. Crane	115
Total	2539

Fifth place. Six teams entered.

Royal Navy	2647
Regular Army	2589
Royal Marines	2556
Territorial Army	2542
R.N.V.R.	2368

INTERNATIONAL HONOURS.

"Elcho" Challenge Shield (Match Rifle).—Open to one team of eight from England, Scotland and Ireland. Distances, 900, 1000 and 1100 yards.

Sqdn./Ldr. J. Pearce, Ireland.

The Mackinnon Challenge Cup (S.R.B.).—Open to one team of twelve from England, Scotland, Ireland, Wales and the Colonies. Distances : 900 and 1000 yards.

A.V.-M. F. C. Halahan (captain), Ireland.
Sqdn./Ldr. J. Pearce, Ireland.

The National Challenge Trophy (S.R.B.).—Open to teams of twenty from England, Scotland, Ireland and Wales. Distances : 200, 500 and 600 yards.

A.V.-M. F. C. Halahan (captain), Ireland.
Sqdn./Ldr. J. Pearce, Ireland.
Sqdn./Ldr. E. B. C. Betts, Ireland.
F./Off. H. H. Ellison, Ireland.

PARTICULARS REGARDING ENTRY INTO THE ROYAL AIR FORCE

I.—OFFICERS.

General Duties Branch.

1.—Permanent Commissions.

Permanent officers are entered in such numbers as to provide in the ordinary course of promotion the officers required to fill the higher command, technical and general administrative posts in the Royal Air Force. In the earlier stages of their career they are engaged in becoming experts in flying duties: subsequently a large proportion are expected to specialize in one aspect of the work of the Royal Air Force, *i.e.*, engineering, wireless, armament, photography, or navigation, or in staff duties. The method of entry for permanent commissions is as follows:—

(*a*) *The Royal Air Force College.*—The Royal Air Force College is maintained to afford a special education lasting two years to flight cadets between the ages of 17½ and 19½ on entering the College.

Full particulars are given in Air Publication No. 121; price 3d.

(*b*) *University Graduates.*—A proportion of the permanent commissions granted in the Royal Air Force is offered to University men. Candidates for entry under this scheme must be graduates of their University, must be unmarried and between 20 and 25 years of age, and must be recommended by their University.

Full particulars are given in Air Publication No. 904; price 4d.

2.—Short Service Commissions.

The balance of junior posts is filled by short-service officers who are employed for a period of five years on the active list, after which they are required to serve a period of four years in the Reserve. A strictly limited number of permanent commissions are awarded to officers holding short-service commissions. The majority of such commissions awarded are allocated to officers qualifying for specialist training, but a few are also granted to those officers recommended as specially suitable by their Commanding Officer. A further strictly limited number of appointments to medium service are made to fill flying posts requiring greater experience. The period of medium-service employment on the active list is five years following immediately after the five-year short-service period, *i.e.*, ten years' employment on the active list, followed by four years in the Reserve.

Officers transferred to the Reserve after completing their full period of service in the active list will be paid a gratuity of £375 for five years' service, and £1,000 for ten years' service.

Entry to short-service commissions is by selection from men who are of good physique and reasonably well educated. Age limits, 18 to 29.
Full particulars are given in Air Ministry Pamphlet No. 13; price 2d.

Stores Branch.

A small number of vacancies for permanent commissions in the Stores Branch of the Royal Air Force are offered annually for competition to men who have had not less than five years' business or industrial experience in the employment of a company or firm of standing, and are between the ages of 23 and 25. Accepted candidates must pass an interviewing board and compete at a written examination conducted by the Civil Service Commissioners.

Full particulars are given in Air Ministry Pamphlet No. 17; price 2d.

Accountant Branch.

A small number of vacancies for permanent commissions in the Accountant Branch of the Royal Air Force are offered annually for competition to men between the ages of 22 and 26 who have a good theoretical knowledge and wide practical experience of accounting. Accepted candidates are required to pass an interviewing board and compete at a written examination conducted by the Civil Service Commissioners, the standard of the accountancy portion of which is that of the final examination of the Institute of Chartered Accountants and of the Society of Incorporated Accountants and Auditors.

Full particulars are given in Air Ministry Pamphlet No. 18; price 3d.

II.—AIRCRAFT APPRENTICES.

Aircraft apprentices are enlisted and trained as highly skilled craftsmen. Period of apprenticeship, three years. Entries take place twice yearly. Candidates are required to pass a competitive educational examination. Age limits, 15 to 17 years. Period of service, twelve years from the age of 18, but suitable men may be allowed to re-engage to complete twenty-four years for pension.

Full particulars are given in Air Ministry Pamphlet No. 15; free.

III.—APPRENTICE CLERKS.

Apprentice clerks are trained in general clerical duties or for specialist work in pay-accounting or in stores-accounting. Period of apprenticeship, two years. Entries take place quarterly. Candidates are required to have either an approved school certificate or to pass a competitive educational examination. Age limits, 15½ to 17 years. Period of service, twelve years from the age of 18, but suitable men may be allowed to re-engage to complete twenty-four years for pension.

Full particulars are given in Air Ministry Pamphlet No. 9; free.

The publications mentioned herein may be purchased from Gale & Polden, Ltd., Aviation Department, Wellington Works, Aldershot.

NON-REGULAR FORCES.

Information regarding the Reserve of Air Force Officers can be obtained from the Secretary, Air Ministry, London, W.C.2. Inquiries

as to appointment to the Special Reserve or the Auxiliary Air Force should be addressed to the officer commanding the squadron to which appointment is desired. The addresses of these squadrons are as follows:—

Special Reserve.

No. 501 (Bomber) Squadron.—Filton, nr. Bristol.
No. 502 (Ulster) (Bomber) Squadron.—Aldergrove, County Antrim, Northern Ireland.
No. 503 (County of Lincoln) (Bomber) Squadron.—Waddington, nr. Lincoln.
No. 504 (County of Nottingham) (Bomber) Squadron.—Hucknall, Notts.

Auxiliary Air Force.

No. 600 (City of London) (Bomber) Squadron.—Finsbury Barracks, London, E.C.1.
No. 601 (County of London) (Bomber) Squadron.—54, Kensington Park Road, Notting Hill, London, W.11.
No. 602 (City of Glasgow) (Bomber) Squadron.—49, Coplaw Street, Glasgow, S.2.
No. 603 (City of Edinburgh) (Bomber) Squadron.—Learmouth Terrace, Learmouth, Edinburgh.
*No. 604 (County of Middlesex) (Bomber) Squadron.—Hendon Aerodrome. Applications to County of Middlesex Territorial Association, 66, Victoria Street, S.W.1.
No. 605 (County of Warwick) (Bomber) Squadron.—Castle Bromwich, Birmingham.
*No. 607 (County of Durham) (Bomber) Squadron.—Aerodrome, Usworth. Applications to The Durham County Territorial Association.
*No. 608 (County of York, North Riding) (Bomber) Squadron.—Aerodrome, Thornaby. Applications to North Riding Territorial Army Association.

* In course of formation.

EXTRACTS FROM AIR MINISTRY WEEKLY ORDERS

R.A.F. ACCOUNTANT OFFICERS.

The Air Ministry announces that an examination will be held next March under the scheme inaugurated in 1924 for the entry into the Accountant Branch of the Royal Air Force of qualified and experienced civil accountants. About six vacancies are likely to be available. The age limits are 22 to 26. The competition will be held in London by the Civil Service Commissioners, and will include (1) an examination in book-keeping and accountancy (excluding partnership and executorship accounts), the standard being that of the final examinations of the Institute of Chartered Accountants and the Society of Incorporated Accountants and Auditors; (2) an examination in English and general knowledge; and (3) an interview before a selection board, at which stress will be laid on accounting experience and special weight given to the type of experience provided by articled service. Application should be made to the Secretary, Air Ministry, (S.7), Kingsway, London, W.C.2, for the regulations and for application forms. Completed application forms should reach the Air Ministry by February 1 or at latest by February 15.

Far East Command—Formation.

1. With effect from 1st January, 1930, all R.A.F. units stationed in the Far East (including the R.A.F. Base, Kai Tak) will be placed under the command of the C.O., R.A.F. Base, Singapore, who will be designated the C.O., R.A.F., Far East. The C.O., R.A.F., Far East, will stand in the same relation to the Fleet Air Arm units in his command, when embarked, as does the A.O.C., Coastal Area, to such units at home.

2. Headquarters, R.A.F., Far East, will be formed from the personnel of the R.A.F. Base, Singapore, without increase in establishment.

3. The C.O., R.A.F., Far East, will hold a full court-martial warrant and summary powers under the proviso to section 47 of the Air Force Act. He will issue a delegated warrant to the C.O., R.A.F. Base, Kai Tak, and will also delegate to him such other powers as he considers necessary, within the regulated limits. On questions of civil law, the C.O., R.A.F., Far East, will consult Messrs. Drew and Napier, Singapore.

R.A.F. Skating and Ski-ing Championships.

1. Initial championships for skating and ski-ing, open to all serving and reserve officers of the Royal Air Force, will be held at Maloja, Switzerland, on 29th January, 1930 (skating) and 30th January, 1930 (ski-ing). A cup will be competed for in each event. The skating cup will not be competed for unless at least ten entries are received.

2. Full particulars may be obtained from E. Weatherall, Esq., 1, Gower Mews, Bedford Square, London, W.C.1, to whom intending competitors should make early application.

3. If sufficient support is forthcoming, it is intended to form a R.A.F. Skating and Ski-ing Association, at a later date. This will depend largely on the degree of interest aroused by the prospective initial championships.

THE ROYAL AERONAUTICAL SOCIETY

(With which is incorporated the Institution of Aeronautical Engineers.)

EXTRACTS FROM MONTHLY NOTICES.

Endowment Fund.

The steady increase in the membership of the Society in recent years has now reached a stage when it is felt by the Council that the growing prosperity and prestige of the Society can only be maintained by the provision of its own building and lecture hall. An Endowment Fund has been started with these objects in view, and the Council hope that members will make every effort to add to the fund. Acknowledgments of contributions to the fund will be made in the *Journal* as received.

Technical Index.

For the past two years, the Secretary has been laying the foundation of a Technical Index which, it is hoped, will be of some value to members of the Society.

The main object of this card index is to provide references to technical articles, official reports, papers, lectures, etc., on all aspects of aviation and its allied sciences. A very wide field has been covered, and, though the index does not pretend to be exhaustive, it is very comprehensive. Among sources of information which have been indexed may be mentioned:—

(*a*) The leading aeronautical papers in Great Britain, Germany, France, Italy, America.

(*b*) Official reports, including R. & M.'s, N.A.C.A. Reports and Technical Notes, Göttingen, Koutchino Laboratory, Amsterdam Institute, Aeronautical Institute of Tokyo, Italian Aeronautical Institute, Brussels Aeronautical Institute, and Canadian Air Board Reports.

(*c*) Library of Royal Aeronautical Society, Library of Congress, Washington Public Library.

(*d*) Scientific journals.

(*e*) Abstracts prepared by various bodies and institutions.

The index contains approximately some 20,000 entries and is being continually added to. The cards are arranged under subject headings, and copiously cross-referenced.

It is hoped that members of the Society will make free use of this technical index and get into the habit of looking upon the Society as the headquarters from which references to aeronautical information can be readily obtained. It should be understood that, as a general rule, references only to any particular subject can be given, as the work involved in sending the actual information would mean employing a very much larger staff than the Society at present can afford.

Photographs Received and Wanted.

The Council wish to acknowledge the gift of photographs of H.M.A. *Beta* from M. Downer, and also autographed photographs of Sir John Alcock and Sir Arthur Whitten Brown and Sir Ross Smith and Sir Keith Smith, with their Vickers-Vimy Rolls aeroplanes from Mrs. O'Brien, widow of the late H. S. O'Brien. The Society has a large classified collection of photographs, and it is hoped that any members who have photographs to spare, especially of the period 1906-1915, will present copies to the Society, to enable it to fill up gaps in the series. All such photographs received, of aircraft, aircraft parts and construction, or aviation personalities, will be acknowledged in the *Journal*.

Contributions to the "Journal."

The Editor will be glad to consider technical articles for publication in the *Journal*, either on aviation or some allied subject. It is hoped that every member will look upon the *Journal* as the medium for the publication of any original work. Special attention is drawn to the valuable awards and medals offered each year for which such work is eligible. Full particulars of these awards will be sent on application.

Souvenir Booklet.

An illustrated Souvenir Booklet was printed in July describing the Society's exhibit at Olympia, and giving a history of the Society. This booklet supplements the account of the exhibit given in the October number of the *Journal*, the two forming a complete record of the Society's activities at Olympia. It is hoped that every member who did not obtain his copy during the exhibition will buy one as a permanent record. The number available is limited, and early application should be made, as it will not be possible to reprint. The price is one shilling, or 1s. 3d. post free.

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Photo] [*Swaine*

THE LATE LIEUTENANT-COLONEL WILLIAM GEORGE BARKER V.C., D.S.O., M.C., ROYAL CANADIAN AIR FORCE.

FLYING IN SOUTH AFRICA

By Lieut.-Colonel K. R. Van der Spuy, M.C., S.A.A.F.

Climate and Meteorology.

South Africa is justly described as the Land of Sunshine, but this description in itself is hardly sufficient to engender that picture of perfect flying conditions in the minds of individuals accustomed to the more rigorous flying conditions met with in Europe. One is apt to associate extreme sunshine with extreme heat, and to many who have not studied South Africa's climate, visions of Indian summers and generally unpleasant tropical conditions are conjured up—quite incorrectly.

It is no exaggeration to make the broad statement that practically throughout the year ideal conditions for flying are met with in South Africa. True, the country has its fogs, thunderstorms, hail and winds, but the first-mentioned are of rare occurrence and almost entirely confined to the Southern coastal regions; thunderstorms are local in nature and can be avoided, and strong winds, except in the Cape Peninsula, are extremely rare—even in this area the winds seldom reach gale strength and the average monthly wind velocity at Cape Town over a period of 12 months is about 12 miles per hour. As for temperatures, although the Union of South Africa is situated between the fairly low latitudes of 22° and 35° South, its climate is cooler than that met with in similar latitudes in the Northern Hemisphere. In point of fact, the various parts of the sub-continent have a mean annual temperature corresponding to that found in Europe 70° to 10° further from the Equator. This amelioration of climate is mainly due to two causes: firstly, the configuration of the country, and secondly, the comparatively small land area which admits of the winds from the vast surrounding oceans exercising a moderating influence over the country.

Owing to the plateau structure of South Africa, there exists a remarkable uniformity of mean annual temperature over the greater part of the Union. Thus Cape Town, in latitude 33° 56′ South, altitude 115 feet, at the South-Western extremity of the country, has an average of 62.6° F., whilst Johannesburg, in the Transvaal High Veld, in latitude 20° 11′ South and at an elevation of 5,750 feet, has a mean temperature of 60.60° F.—an extremely small difference. These

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temperatures are practically the same as the summer temperatures of England and about the same as those of many of the best-known health resorts of the Mediterranean, including the Riviera. For purposes of further comparison it may be useful to state that the mean maximum temperature during the warmest months of the year—December to February—at the warmest place in the Union rarely exceeds 90° F., whilst the minimum at the coldest place does not fall below 27° F.

It is apparent, therefore, that the performance of aircraft is in no way likely to be adversely affected by any of the climatic conditions mentioned above, and it may be of interest to state here that since 1921 only one flying accident has been recorded as attributable to the weather conditions prevailing at the time—low clouds in mountainous country.

It has been mentioned that thunderstorms, in connection with which by far the greater portion of the precipitation over the summer rainfall area occurs, are avoidable. In point of fact, they can usually be clearly discerned from many miles away, their direction of travel noted, and by making a slight detour they can be avoided. Apart from thunderstorms, however, there are regular periods of rainfall, varying in intensity according to locality. Periods of continuous rain have been known to last for as long as seven days up-country and for longer periods at the coast, but visibility during these periods has rarely been so bad as entirely to preclude the possibility of flying, and where any service has been in operation aircraft have functioned regularly according to schedule.

Topography.

Some years ago, whilst on a flying visit to the Cape, the Press quoted Mr. (now Sir Alan) Cobham as describing the whole of South Africa as "one huge aerodrome." To those of us who know South Africa from the flying point of view this inaccurate reference made amusing—if uninstructive—reading! Unfortunately, Cobham must have based his deductions as to the nature of the rest of South Africa on what he observed whilst flying over a portion of it between Pretoria and Cape Town, in which portion some very good ground undoubtedly exists, but the dictum is far from being correct.

Topographically, the Union of South Africa may be regarded as consisting of a series of four elevated plains or plateaux separated from each other by steep escarpments rising to a considerable elevation above the plains. This division into plateaux is most apparent on taking a section across country from south to north, but is not so well defined on proceeding from the east or west. These plateaux are as follows:—

(1) The Coast Plateau or Coast Flats, having an average elevation of 500 to 600 feet and varying in width from about thirty miles in South-West Africa to three or four, or even less, in the south-east of the Cape Province.

(2) The Southern or Little Karroo, a narrow table-land about fifteen miles in width crossed from east to west by a series of parallel mountain ranges separated by narrow valleys; its average elevation is about 1,500 feet, and it is separated from the coast belt by the Langeberg and Outeniqua Ranges.

(3) The Central or Great Karroo has an average elevation of between 2,000 and 3,000 feet. It is bounded on the west by the Cedarberg and Bokkeveld, and on the south by the Witteberg, Zwartberg and Zuurberg Ranges.

(4) The Northern Karroo or High Veld is the innermost plateau comprising the greater part of the remainder of the Cape Province, the Orange Free State and the major portion of the Transvaal. It is encircled on the west, south and east practically, from the Limpopo to the Orange River, by the mountains of Namaqualand, the Roggeveld, Winterberg, Stormberg and Drakensberg Ranges, constituting the great escarpment. This plain has an elevation of about 4,000 feet, rising in the north-eastern portions to 6,000 feet in the Transvaal High Veld and 10,000 to 11,000 feet in Basutoland, and forms the main watershed of the country.

Outside of these areas lie the Transvaal Low Veld, Swaziland, Natal, Zululand and the eastern uplands of the Cape Province, the native territories of the Transkei, the mountainous south-west including the Cape Peninsula and the west coastal area. The greater portion of South Africa has an elevation of over 3,000 feet, whilst the area below 1,500 feet consists merely of a narrow fringe round the coast.

This general topographical description should be sufficient to show that South Africa is anything but "one huge aerodrome," but for the benefit of those who desire a more intimate knowledge from the flying point of view, a more detailed description may be of value; to facilitate easy reference to a map, the different Provinces will be dealt with seriatim and areas will be shown as falling under the following categories: A—Good, B—Fair, C—Bad, D—Very Bad, from the flying point of view.

The Transvaal Province.

The country north of a line drawn east and west through Pretoria is bush, and, except for scattered farms, uncultivated. Practically the whole of this area falls under Categories C and D. Natural landing grounds are non-existent.

South of this line the bush disappears and gives way to open undulating veld, pastoral and agricultural. There are numerous farms where landings can be made in ploughed fields or old agricultural lands. This area can be classed under Category A, but only in so far as agricultural lands are concerned, as the natural veld contains numerous ant-heaps, rocks, etc., and is in the main unsuitable for landing.

The Orange Free State.

The whole of the northern area may be described as falling under Categories A and B, but the remarks concerning the Southern Transvaal apply equally and more especially to the area south of a line drawn east and west through Bloemfontein. The country is much flatter, is interspersed with isolated rocky kopjes, and gives the false impression from the air of being suitable for landing anywhere. Actually the natural veld is rough, very stony in parts and is covered with numerous ant-heaps, ant-bear holes, etc.

The Cape Province.

All the country lying to the north and west of the main line from Cape Town to Vryburg may be classed under Categories C and D, being of the dry Karroo type, of a broken nature in the southern half, stony, covered with small Karroo bush and most unsuitable for landing or taking off. The northern area is extremely dry and sandy, being the southern fringe of the Kalahari Desert, and in extensive parts is covered with thick bush and high camelthorn trees. Farming in this area is confined mainly to ranching, and consequently agricultural fields are few and far between.

That portion of the Province lying east of the Cape Town—Hopetown railway varies considerably, and taken as a whole may be described as fair. The central south-eastern portion is extremely mountainous and falls under Category D. The coastal area from Cape Town to East London may be classed under Category A, and the country north of this, whilst giving the impression of being suitable, falls under Categories B and C. The country between the towns of Prince Albert, Graaff-Reinet, Middleberg and Hopetown is Karroo and in most parts is entirely unsuitable. The greater portion of this area is ranching country, the agricultural portion of the Province being in the vicinity of the coast. The population is considerably denser than in the areas described in the preceding paragraph, and consequently the air pilot has greater opportunities of making for small agricultural lands in the event of his having to make a forced landing.

Mountainous Type of Country.

"Valley of a Thousand Hills."

Portion of Hex River Valley.

NATAL.

As in the Cape, the ground features vary considerably. The coastal belt is covered with sugar-cane growing to a height of twelve feet; where not cultivated for this purpose, the ground is extremely undulating and covered with thick natural bush, Category D. From the coast the ground rises steeply to the highlands and is very undulating, but open. There is a large agricultural population, and except for certain very hilly areas, such as shown in the accompanying photograph of the "Valley of a Thousand Hills," forced landings would not present any great difficulties. In the north and north-west, as far as the Drakensberg Range, levels are more uniform, and suitable agricultural fields exist practically everywhere. These areas fall under Category A. In the north and north-east, however, the country is thickly covered with bush, and very little cultivated land exists; the latter part falls under Categories C and D.

BASUTOLAND.

The whole of this area is extremely rugged with numerous high mountain ranges and narrow valleys containing smaller hills. The population is native, and consequently the cultivated fields which exist on the slopes are very small and quite unsuitable. The whole area may be classed as D, and very few places exist where a suitable landing ground could be prepared.

SWAZILAND.

The major portion of Swaziland is mountainous, with narrow valleys and undulations, open in parts, but mostly unsuitable. The eastern portion falls very steeply to the plains, which are swampy and heavily bushed. The whole area would fall under Categories C and D, but many places exist where landing grounds could be prepared.

SOUTH-WEST AFRICA.

The coastal area, extending for a depth of approximately thirty miles, is waterless, sandy desert. The remainder of the territory is dense bush with numerous mountain ranges. Farms are very scattered and are used for running cattle, so that few agricultural fields exist. The only natural landing grounds consist, out of the rainy seasons, of the dry beds of "pans," and, occasionally, river beds. The territory as a whole would fall under Categories C and D.

BECHUANALAND PROTECTORATE.

Waterless desert—Category D.

Conclusions.

From the foregoing it is quite apparent that, taken as a whole, South Africa is by no means composed of terrain ideal from the flying point of view. It cannot, for instance, be compared with Western Europe, where agriculture is on a large scale and fields suitable for landing exist everywhere. As illustrated, good territorial conditions are met with in different areas, and in most parts landing grounds could be prepared, but natural facilities are lacking. The erroneous idea formed by flying visitors as to the actual nature of the ground is excusable in that most of the country, as seen from the air, appears to be suitable—the numerous features, not being observable from a height, contributing to the opposite. For instance, farms in South Africa are divided by barbed wire fences and frequently sub-divided into paddocks or "camps." These fences cannot be seen from a height. The industrious termite builds his nests by the thousand, and these dangerous obstructions, ranging from six inches to three feet in height and the same in diameter, are in many cases hidden from sight by natural grass. From a height of four thousand feet the Karroo, which appears to have a billiard-table surface, is found, on near approach, to be covered with small hard scrub, cactus, countless boulders and numerous erosive ruts—all of which are contributory causes towards disaster. Atkins has voiced a truism in stating that "Nothing on the face of South African Nature is what it seems."

Without closer investigation, therefore, of the ground features, it is extremely injudicious on the part of individuals to make definite pronouncements as to the excellent conditions pertaining, since the broadcasting of such erroneous ideas may have far-reaching effects on others who perhaps desire to embark on enterprises where presumption of the existence of good intermediate ground between points may be of the greatest importance.

In regard to existing landing grounds, it may be mentioned that in all about one hundred and forty aerodromes have been prepared at various places in South Africa—mostly by the South African Air Force in connection with air co-operation with local defence units. At the larger centres these are maintained through the activities of light aeroplane clubs, but in the majority of cases, at the smaller towns where aircraft only occasionally visit, the depredations of ants have resulted in the landing grounds becoming dangerous for use. Since, however, the main obstructions have been cleared, they could be made available at short notice, and in this connection the local municipal authorities are always willing to assist.

The topographical features of South Africa do not readily lend themselves to the use of flying boats or seaplanes outside of certain restricted areas. On some of the larger rivers—notably the Limpopo,

the Vaal and the Orange and others emptying into the Indian Ocean, this type of aircraft might be used at selected places, but, generally speaking, this would be inadvisable without constant careful inspection. South African rivers as a rule are shallow and make their tortuous ways over boulder-strewn beds in the valleys, between high banks. Being entirely dependent upon precipitation, their water level varies considerably, and when in flood the flow is too powerful to permit of aircraft being used. In the dry season many of the large rivers exist merely as sand-courses with occasional pools. Others such as the Nosop, Molopo and Kuruman, which on the map would appear to offer excellent waterways many hundreds of miles in length, are actually dry beds, sandy and rock strewn.

Many of the lagoons at the coastal river mouths are suitable, but, as these are tidal, other difficulties arise. Finally, an important factor to bear in mind is that, owing to the flood water, foreign obstacles such as trees, etc., are frequently carried downstream for many miles, thus rendering unsafe stretches of water which for months may have been made use of without danger.

Maps are an important adjunct to the airman, and in this connection his wants in South Africa are adequately catered for. Many reliable maps of various scales, all showing essential features such as railways, roads, rivers, towns, villages and mountain ranges, are available. Of the maps most frequently used by airmen may be mentioned those published by the Surveyor-General, Cape Town, scale 1 : 1,000,000 (15.77 miles to the inch), and by E. Stanford, Ltd., London, scale 1 : 2,000,000.

Of the fact that South Africa is a pleasant land in which to fly there is no question. Visibility, owing to the small humidity content, is as a rule so excellent that the many prominent landmarks existing can be seen from a hundred miles off, and even farther, when flying at say five thousand feet. This, combined with the almost ideal meteorological conditions encountered, not the least noticeable of which is the rarity of fog, is a condition not enjoyed by our less fortunate brethren in Europe, and one which, beyond doubt, is contributing in marked measure to the growth of airmindedness in the sub-continent—as evidenced by the numerous light aeroplane clubs extant and in process of formation, and the increase in privately-owned aircraft.

THE SUPREMACY OF AIR POWER.

DEAR EDITOR,

You have asked me to contribute to your new Quarterly. First, may I congratulate you on its appearance, for not only was such a publication badly needed, but to me it shows that freedom of speech—or, shall I say, some freedom—is to become part and parcel of the Royal Air Force policy. You and your Service are in many ways to be envied; you have youth on your side, and that enthusiasm which is known to youth alone; also, you have three dimensions to move in; but even a greater asset than this is that you have no traditions, and, like Henry Ford, I trust that you have no intention of founding any. The future lies before you stretching vastly over the horizon, and air power is not yet twenty-seven years old; well can you let the past take care of itself. For the work you carried out so gallantly twelve years ago was nothing more than the play of the nursery.

We live in an extraordinary age, an age of wonders. A few weeks ago I picked up a copy of *The Daily Telegraph,* and as my eyes ran down its columns I noticed a headline, "New York to London in Six Hours": a miracle twenty years ago, and to-day a possibility. The proposal was to build an aeroplane to carry 500 passengers and a crew of 100. It was to cost £1,000,000; be propelled by twelve 1,000 horse power motors miles above the earth at a speed of 500 miles an hour.

In this same paper, the next day, I looked for further information on this wonderful machine, but found none; in place, a headline which caught my eye: "Strange Cult of Caruso." Here I learnt that the embalmed body of the great singer is exhumed every three years and re-dressed by his sorrowing friends. "At present," we are told, "he is wearing a frock-coat, and Tito Schipa says he looks well in it."

Indeed, this age is an extraordinary one, a compound of the lowest barbarism and of the highest science. Of all those emotions which brutalize and make war, and all those exalted thoughts which, so I hope, will end war by debrutalization. When once we can breakfast in London, lunch in New York, and be back home again for supper, and all in twenty-four hours, it seems to me that life will become far too brief and exciting to wait for three years for the re-opening of any man's grave in Naples or elsewhere, or to worry whether its occupant's frock-coat is still of the latest cut.

What has all this got to do with you? Everything, for you are the heralds of a new means of movement, a means, so it seems to me, which is destined to change civilization, and with it the nature of war. And now to descend to my base of operations—mother earth.

Should armies remain more or less as they are, that is to say, infantry forces, with all the other arms harnessed to the infantry idea, then your military conquest will be an easy one, too easy even to make it exciting. Do not, however, be deluded by such possibilities, for change is inevitable. One reason for this is that no nation is again going to accept the infantry casualties of the last war. Another is that no air target could be more admirable than a long infantry column, with its impediments, its serfdom to road and railway, and its many semi-static headquarters. Yet another reason, and the most potent, slow-moving infantry can no longer protect the civil will.

Frankly, my concern for your future does not lie in this direction, it is to be discovered nearer home, for it is hinged on your own irrational, though obviously self-interested, actions. You struggle to take over the policing of uncivilized areas and the defence of coastal fortresses, when a child can see that you make the most indifferent of constables, and to restrict your mobility of sitting in Aden is almost a practical joke. But, after all, perhaps these are but back doors and badly-fastened windows leading into that great and ancient military mansion which one day you will claim as your inheritance.

It is, however, almost inconceivable that the soldier will for long continue to go on marching in this age of car and char-a-banc. Already has the writing appeared on the wall, and it reads, *Why walk?* Increasingly is infantry recruiting becoming more difficult, because we are ceasing to be a walking race. Industrialism means mechanization of military forces, whether soldiers or civilians want it or not. If armies are to continue to exist, then mechanization is as vital to them as to-day it is vital to you. Where you were thirty years ago we are to-day; then you were in balloons—the top of the winds; we are still on our feet—the plaything of roads and railways. If the army does not mechanize you will become the army, and the army will be swallowed by the police force, a force destined to walk until the crack of doom, an uncomfortable and unprogressive force, yet a highly necessary one.

Assuming that the army will be mechanized, and that it cultivates a mechanical spirit which has little to do with polo and hunting, and assuming that you have advanced in your search for plunder, no further than the kitchen and the offices of the military mansion, what influence is military mechanization going to have on you? Here is something much more entrancing than the straits of Bab-el-Mandib, the Kurram Valley, or the ruins round Mosul.

Before examining the influence of a mechanized army on your future, I think it is wise to consider mechanization from a general point of view. What is going to be its strategical influence?

Have we any foundation to work upon? Yes, the mechanization of the Navy some seventy years ago. I do not suggest that identical changes are going to take place, because nations live on the land and not in the sea, but I do suggest that, as navies are the creations of industrialism, and that mechanized armies must also draw their strength from industrial power, there is a common link in the evolution of both.

To begin with, I will compare warfare at sea when warships relied on sail-power with warfare at sea as it is to-day.

First, what do we see? We see that the size of a nation has little to do with sea-power. Holland, Denmark and Portugal were once mighty naval powers, and even single cities, like Venice and Genoa, controlled formidable fleets. Warfare at sea was prevalent, and only two or three centuries ago incessant, for then piracy abounded. Nearly every type of sailing ship was a potential warship, consequently the power to indulge in naval warfare was the common property of maritime nations, great or small. Then came the steamship, and the whole of naval warfare changes. Special types of ships, and ships which are no use for commercial purposes are built, and only wealthy industrial nations can afford to build them. The influence on piracy, naval small wars, is most marked, so marked that to-day piracy is almost unknown. In sailing-ship days pirates could thrive; in steamship days they cannot. The influence of the steamship on great naval wars was equally remarkable, so remarkable that to-day only three or four of the greater industrial nations can contemplate naval warfare. The steamship has, in fact, very largely restricted war at sea; this has been its most important, yet least appreciated, influence.

To turn now to mechanized warfare on land. In this sphere of conflict is not there every likelihood of the petrol engine influencing the frequency of war as the steam engine influenced war at sea? Small wars will surely disappear. Small nations will not be able to indulge in war, for only the greater industrial nations will be able to afford it. The strength of armies will no longer be reckoned in terms of man-power but in machine-power; conscription of a nation's manhood will no longer be a measure of strength. Will not, therefore, land warfare become less prevalent? To answer this question we must examine the tactical side of mechanization.

Mechanized battles will depend on the nature of the enemy and the nature of the ground. Will the armies of to-day find any place in the future? We know that large tracts of country will always exist over which the mechanized armies will have the greatest difficulty in moving freely. Will not infantry still find a tactical play-ground here? I do

not think so if we can imagine what a mechanized battle will look like. It will consist of a series of rapid manœuvres, of feints, advances and retirements, followed by sudden and annihilating blows. Such battles will in one respect resemble actions at sea; they will be short and sharp, and not prolonged operations. A few hours may see the complete destruction of a large mechanized army, or its withdrawal to some land port, where it will risk blockade.

In such a war what use are infantry even if they occupy anti-tank positions? Should they become an annoyance their line of supply will be cut, and they will be besieged in their natural strongholds by tanks and aircraft. They will only be an encumbrance, and the little good they can do will be so outbalanced by the perpetual anxiety of supplying them that they will seldom be worth their pay. Cut away the usefulness of infantry, and conscription has little reason to exist. The nation in arms, the creation of the Napoleonic wars, will become a thing of the past, and will give way to comparatively small long-service armies. The answer, therefore, is that wars are likely to become less prevalent, petrol-power causing the same restrictions in land warfare as steam-power already has done in sea warfare. Further than this, possible theatres of war will shrink in size, only such areas as are suitable for mechanized warfare becoming prospective battlefields. A country like Switzerland will practically be immune from war; even to-day few nations wish to fight in such a land, yet if Switzerland were to become pugnacious a few mechanized forces, by occupying its railways, could starve her out.

Mechanized warfare means fighting on the plains, therefore it is inconceivable that nations which possess great open stretches of country are not going to fortify them against mechanized attack. To maintain a superior mechanized army is not enough. Surprise is so likely, and battles may be so decisive, that no risk can be run.

Before we, as a nation, took to steam-power, our sailing ships could seek refuge in any sheltered cove. After it, defended harbours and coaling stations had to be constructed in every sea, so that our warships would possess bases of action to operate from, and harbours of refuge to refit it. In modified form, will not somewhat similar changes take place on land. Will not a nation more strongly than ever defend its frontiers, and will not these defences cover areas rather than occupy positions and block communications? Myself, I think they will resemble a broad net of works drawn out along the frontier, each knot representing an anti-tank fort or strong point.

It may seem that the cost of such a defensive system will be prohibitive, but I do not think that this necessarily follows, for a small concrete work with a gun in it is practically invulnerable to tank attack. Further, any stream, even at comparatively little cost, could be con-

verted into an obstacle. Granted that such networks of defences are possible, then their influence on future tactics may be extraordinary.

To fight in one's own country has always been a much simpler operation than fighting in the enemy's. For instance, in the Civil War in America, though the Federals were vastly superior in numbers and equipment to the Confederates, the fact that they had to invade the South, and so constantly operate in an enemy's country, nearly cancelled out all these advantages.

Granted these fortifications, the picture now changes. Remember that on account of cost no nation is likely to have an enormous number of machines, consequently decisive battles will be avoided as they are at sea unless one side has a manifest advantage. Now if both sides be approximately equal, obviously the side which can make full use of its anti-tank defences as pivots of manœuvre and shields against attack will possess an asset of almost incalculable value. Even if one side is considerably weaker than the other, when this side is able to fight within its own frontier, that is, within its defensive zone, the stronger side is not likely to attack it in a hurry, but to proceed methodically towards its objectives.

We see here a return to a new form of static or semi-static warfare, forgotten by enhanced mobility. Whilst in the past field armies frequently had to halt until their line of advance was cleared of a castle or a fortress, in the future, quite possibly, mechanized armies will have to halt until a whole area is cleared of anti-tank defences. The conclusion is, therefore, a dual one. Either the invader will advance with extreme caution, or he will attempt to entice his adversary to abandon his fortified zone and enter his enemy's. In both cases there is likely to be a prolonged delay, and it is this delay which will bring to the fore the enormous offensive power of aircraft.

There is nothing new in this swing of the tactical pendulum. Mobile warfare always begets static warfare, and static warfare stimulates man's mind towards reinstating mobility. Thus Napoleon marched all over Europe; then by degrees bullet-power became so great that for three years during the World War we never marched at all. Static warfare begot the tank, and there can be little doubt that the tank will beget a new static war. Therefore, failing some unknown invention, it appears to me that this new static period will be solved by the mobility of the aeroplane, which can surmount all land defences.

If this is a correct judgment, then we may expect to see the following type of military organization. Whole countries, or their frontal zones, will be protected by anti-tank defences and fortifications. Within these fortified zones tank forces will be concentrated. The zone will be the castle of the past, and the tank forces their sally parties. Neither side will attempt to rush its enemy's castles, each will, so to speak, "sap"

[R.C.A.F. Official Photo

R.C.A.F. Air Station, Ottawa.

[R.C.A.F. Official Photo

R.C.A.F. Air Station, Cormorant Lake.

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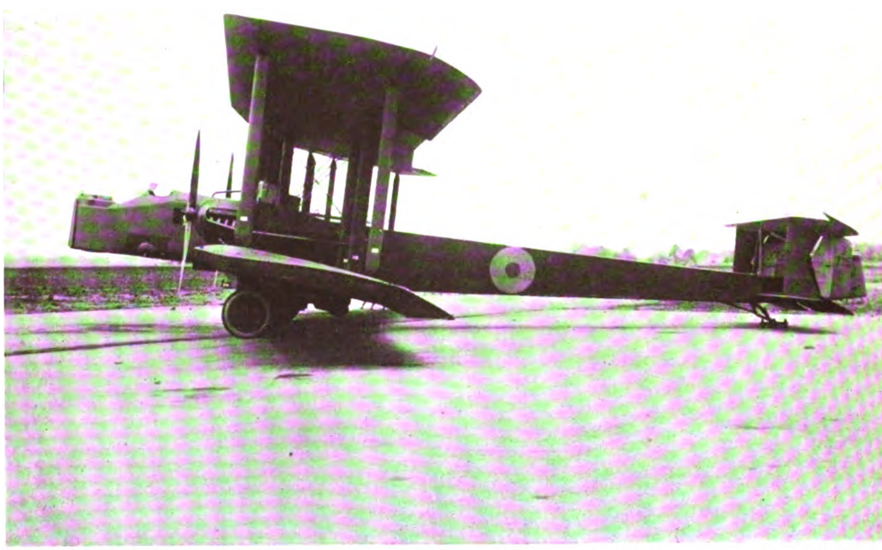
Vickers Victoria, Two Napier Lion XI Engines.



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Vickers Virginia, Two Napier Lion XI Engines.

towards the other, will push forward slowly, and sallies will be made to frustrate this "sapping."

The true offensive arm will be aircraft. Their landing grounds and rear services will be within the fortifications. From these aircraft will be "fired" over the frontier against the enemy's vital points. It will no longer be a question of whether civilians can be attacked or not, for the land stalemate will justify any and all means of attack until civilized nations realize the folly of war, or a new static counter-agent is invented. In any case, when the civil will becomes a recognized objective, wars will still further be restricted. Thus we see, step by step, from flint axe to super-aeroplane, that every great tactical invention, instead of enhancing the god of war, undermines his temple.

Turning now from the speculative to the actual, are there any portents and signs which would lead us to suppose that the supremacy of the air arm is predestined? I think there are.

First and foremost, the third dimension to a large extent includes the second. Aircraft will, as far as we can see, be always influenced by gravity, but because they are all but influenced by water and land they have the power of rendering warfare far more simple.

Secondly, their great ally is the ether, they, born of the air, must court this still more attenuated element, for the ether is their true mistress, and once they have won her we shall see the birth of some strange children. The control of the ether is by wireless wave, an etheric vibration, the heart throbs of this great sorceress of future war. To-day a wireless message can be sent from an aeroplane to a General many miles away. He compares the message with his map, dictates his orders, and sends them on by wireless to his troops. All this is actual, there is no speculation about it, and the fact to note is the growing importance of air power, and not the celerity of imparting information.

Now turn to information. The weak point is that it is far too slow. Let us, therefore, carry the system one step further, and make not an altogether impracticable suggestion. Suppose the pilot had what I will call an automatic pointer, where he moves from place to place on his map, according to where he sees the enemy on the ground, and by a few Morse dots and dashes reports their strength and probable intention. Suppose that this pointer automatically sets in operation a similar pointer working over a similar map in the General's office, the General will at once see what the pilot or observer sees, then he can issue his orders almost instantaneously by another pointer to the pointers of his Subordinate Commanders. There will be much looking at maps but very little writing. The fact to note is the enormous importance of the pilot: he has become almost, if not quite, as important as the General, for should he make a mistake the General

will repeat it; consequently, unless General and pilot see eye to eye, strategically and tactically, there are likely to be some terrible blunders. Surely, then, it would be better to fuse army and air force into one, so that a common education may be established. The weak point is two brains and not one brain.

Still there is another development you should examine. We know we can set in movement machines, coastal motor-boats and even battleships by wireless power. We know that throughout the history of war there has been a constant tendency to eliminate danger. Surely on many occasions it would be wise to use manless weapons as projectiles! For instance, we want to bomb a great city strongly protected by anti-aircraft defences, and we do not want to send two or three hundred brave men to certain death, besides, being human, they may prefer to live and not make quite certain of the city. So instead we send out 200 bombers, escorted by ten controlling machines. The bombers are unmanned and carry no bombs, for they are in themselves winged projectiles, true aerial torpedoes. They are controlled by the ten machines, each of which is manned, and each of which by wireless directs the flight of twenty manless flying mines. As the city is neared and the air defence guns begin to fire, the ten controlling machines stand off and manœuvre their projectiles towards their goal. Some are shot down, and as they strike the ground they disintegrate with terrific detonations; others move on, then dip, rush to earth and explode.

Expensive in aircraft you say? Certainly, but very cheap in human life. After all, an 18-inch torpedo costs, I believe, as much as a large aeroplane, and if the Navy can afford such weapons why should not the Air Force? And when the Air Force does afford them, perhaps the Navy will find that theirs are no longer required.

Should such a form of war be evolved?—and I see no logical reason why it should not—then turning back to that speculative, though probable static, war which is likely to follow fully mechanized warfare, I also see no reason to doubt in the future supremacy of air power.

Your future is not immediate; you cannot, like Minerva, spring full-armed from the head of Jove. Nevertheless, my opinion is that when once war on land is rendered really mobile, that is when armies become mechanized, a static period will follow, and that out of this period you will emerge and simplify war by annihilating it altogether.

Yours, etc.,

J. F. C. FULLER.

THE AEROPLANE VERSUS THE MERCANTILE MARINE.*

By Air Commodore C. R. Samson, C.M.G., D.S.O., A.F.C. (R.A.F., Retd.).

Great Britain depends for her existence upon the Mercantile Marine, and the importance of the unimpeded passage of cargo steamers to this country is every day becoming a more vital factor in our life. It is unnecessary to enlarge upon this point, which is well understood nowadays by even the man in the street.

Up till recent times, the possession of the most powerful navy in the world rendered us able to sleep comfortably, realizing that we were fairly safe from serious risk; but the submarine rudely awakened us to the fact that we were fighting with our backs to the wall. The history of our efforts to combat the submarine demonstrated that we had gone to war practically unprepared to defend our shipping, except against surface craft. Even against the attack of these, we seemed to have forgotten the lessons of the Napoleonic wars, and failed to thoroughly understand the absolute necessity for convoys, with escort.

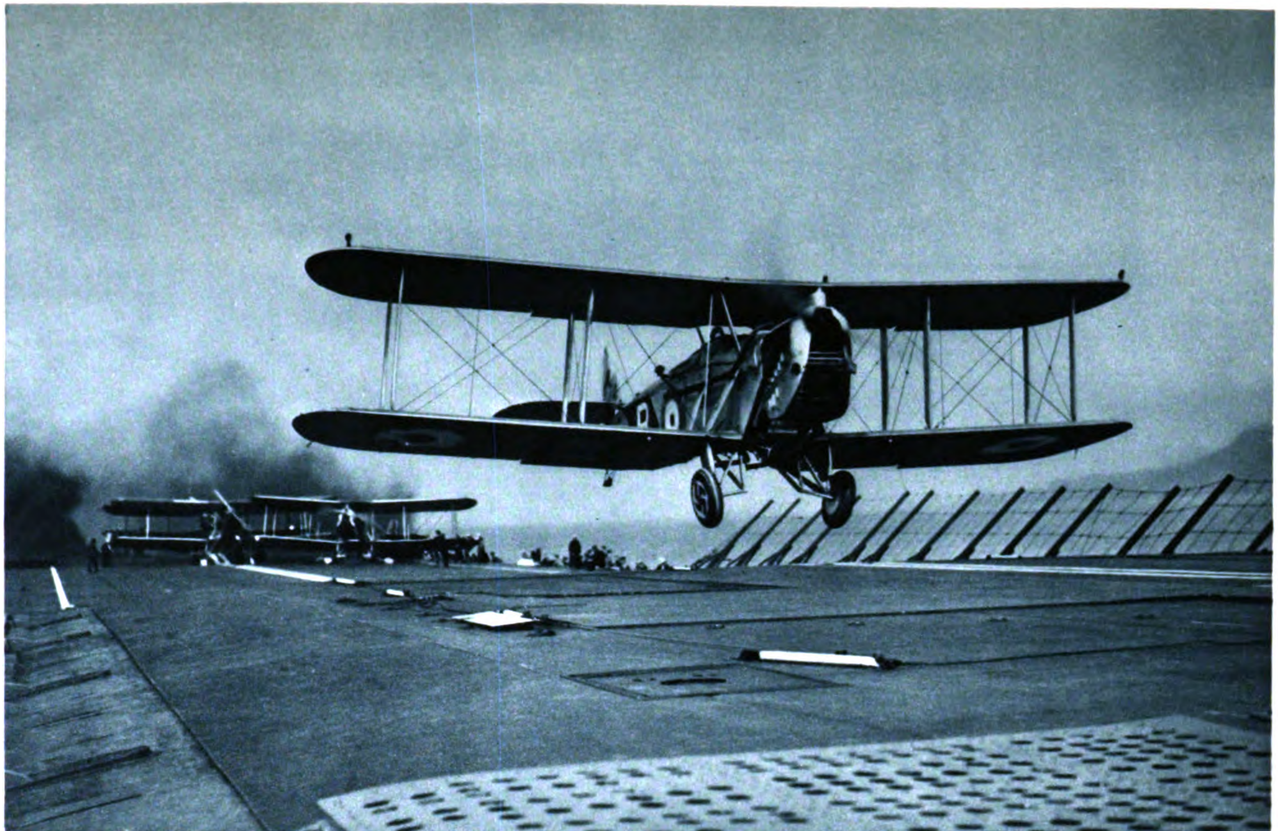
It is doubtful at the present time, even in the light of our war and post-war experiments, if we could face with reasonable confidence another strong submarine attack upon our mercantile marine. Experience proves that, however powerful and eloquent its protagonists, the large warship is by no means the trustworthy guardian that its ancestors were in the past. Even light cruisers are poor trade route protectors. With the arrival of the aeroplane, our mercantile shipping has an additional enemy to face, and a far more active and elusive one it will prove to counter than was the submarine. However we look upon the question, recent modern warlike inventions have made any small nation in close proximity to one of our main trade routes a very dangerous menace if she has an air force of any size. This is especially so in the Mediterranean, where attack on our merchant shipping is easy to carry out, and interference would cost us dear. This is no idle statement, but a serious fact.

In the case of powerful nations it is positive that we should be hard put to prevent our merchant ships from being swept out of the Mediter-

* Reproduced from *The English Review*, February, 1930, with the kind permission of the Publishers, *The English Review* (1911), Ltd., 4, Dean's Yard, Westminster, London, S.W.1.

ranean, and our Navy would have its work cut out to defend itself, let alone protect the merchant ships, against attack from squadrons of aeroplanes. The straits of Gibraltar and the Malta channel can be compared to narrow defiles overlooked by high mountains; trade routes thus situated are obviously dangerous highways. Whether the League of Nations and the present-day general trend of International politics will be powerful enough to lay down, and also ensure, strict obedience to all fixed rules of warfare, it is difficult to know. At present the uninstructed observer undoubtedly has reason to expect that some adequate result will be obtained from the obviously sincere efforts being made by the Prime Minister and President Hoover to reduce armaments and replace the potent menace of armed force by some pacific method of trial by International judges and jury. Signor Mussolini's speech the other day, however, seems to convey to the average person that different views may be held, and that nations must still maintain adequate force to protect their interests. It is obvious, however, that many years will pass before the human race can be educated to rely upon conference or conversation, whatever you like to call it, in place of military effort to maintain its existence in the face of aggression. If arguments fail, and the International Court cannot insure obedience, then the gloves will be off and fighting will begin. No enemy will fail to strike, with any means in his power, at the largest chink in our armour, which is undoubtedly our merchant ships.

The aeroplane, by which term I include all types of heavier-than-air craft, such as aeroplanes proper, seaplanes, etc., will provide our enemies with a most formidable weapon. It has the advantages of: (*a*) Cheapness of production and operation, (*b*) rapidity of attack, (*c*) economy in personnel, (*d*) ability to elude blockade. There is a powerful school of thought that tend to minimize and even deride the ability of the aeroplane seriously to damage or sink ships. The well-known American experiments, which were described in the Press some years ago, proved that warships could be sunk by bombs dropped from aeroplanes. Probably the Admiralty are fully aware of the possibilities. Anyhow it is obvious, from a glance at the published details of new warship construction all over the world, that protective armouring against bombs is incorporated in the design of all new ships. No doubt the latest type of Capital ship or large cruiser, with its strengthened deck plating and adequate underwater protection, may be made fairly safe from aeroplane assault; but the thin-skinned, poorly subdivided merchant ship would certainly be sunk by either the bomb or torpedo. One fact is certain, that the advance in aeroplane design permits of far larger bombs to be carried than was the case in the war. The enormous DO.X., built by Herr Dornier, can carry nine tons of useful load for 500 miles.



[Photo: Charles E. Brown

"Taking Off"

Before discussing the strategy and tactics of aeroplane attack on merchant ships, it is as well to consider briefly the armament that the aeroplane could carry. Neglecting gas, of which no doubt the possibilities are immense, we have the gun, the bomb and the torpedo. Each possesses certain advantages and disadvantages, and their uses have been frequently demonstrated to the public and discussed in the Press. The gun has not had as much advertisement as the other weapons and has been little used up to date. It will, however, one day have to be seriously considered as an aeroplane weapon, as it possesses certain advantages of accuracy and rapidity of fire; also more ammunition can be carried for it, and replenishments made from advanced bases without as complete an organization as for the other weapons. It has, of course, less hitting power than the bomb or torpedo; but against a merchant ship the gun in time will become an effective weapon. Specially designed guns, with adequate recoil systems and fairly low muzzle velocity, and firing 40 to 50 pound shells, could no doubt be carried in specially designed aeroplanes of large size. The effect of projectiles of this size striking a merchant ship at angles of anything between 30 degrees and the vertical would be considerable.

Before leaving the gun, we should realize that the advent of the large German flying boat has opened the eyes of aeroplane constructors to the practicability of even larger craft, although in the past several experts seemed to hold the opinion that large sizes were not possible. The utility of the aerial bomb has been proved by the war, and needs no further discussion except to repeat the well-known fact that, provided correct type fuses are used, as much or even more damage can be achieved by close misses as by actual hits on the targets. With the torpedo every nation has had plenty of experience. It was very little used, however, by aeroplanes in the war, principally due to a lack of appreciation of all the problems entailed in discharging this weapon; also inefficient seaplanes available for the work.

It was always astonishing to several people why the Germans gave up using the torpedo after their first efforts against merchant shipping in the North Sea. The History of Zeebrugge seaplane station, written by a German officer, explains a good deal of the difficulties they encountered, but does not adduce sufficient reasons for their total abandonment of this powerful engine of destruction.

The strategy of an enemy using air power against our trade will, of course, vary with the geographical position of his country and colonies in relation to Great Britain and our main trade routes. At a first glance, it seems that the ideal spots upon which to concentrate the attack are our home ports, where will be found the largest collection of targets as well as other advantages. In most cases, however, the range will be too great. In addition it is apparent that we shall or

should make every effort adequately to defend these vital spots by gun, searchlight and fighter aeroplane, with the essential ground personnel and equipment, in position, ready to function efficiently at the outbreak of war. It is doubtful, therefore, if an enemy will consider it economical in effort to expose his weakly armed bombers against our specialist fighter aeroplanes, backed up by the ground defences.

That it should be part of our policy to improve the "Fighters" and augment their numbers is one of the obvious developments of Home Defence that we should not grudge to pay for. It is to be expected, therefore, that the principal efforts will be made against our trade in zones that provide the enemy with (*a*) inadequate initial defence, (*b*) numerous targets, (*c*) targets within easy reach of his air bases. There are many such zones: a few that can be mentioned are the straits of Gibraltar, Malta channel, exits of the Suez Canal. It is unnecessary to delve into the tactics of attack in these areas, which are within close aeroplane range of hostile territory, as attacks can be launched of many hundreds of aeroplanes from well-equipped bases.

It is as well to remember that the aeroplane has altered the strategical importance of several territories: some have gained in importance, others have lessened their value. More interesting to investigate are the methods likely to be adopted in attacking the open sea water, such as the passage between Ceylon and Aden, and the voyage between South America and England. Shipping on these routes could only be attacked as a general rule by aeroplanes which are operated by one of the following methods:—(*a*) Aircraft carriers, (*b*) auxiliary aircraft carriers, (*c*) airship carriers, (*d*) long range flying boats.

Aircraft carriers, which can carry and work from 60 to 100 aeroplanes of all types, will, on the trade routes, be terrible engines of destruction, as they combine the ordinary powers of the light cruiser with the increased hitting radius of about 150 miles conferred by their aeroplanes. There is at present one drawback to the employment of aircraft carriers as commerce destroyers: this is the limitation of the tonnage permissible for any power to build. This makes it doubtful if a naval power would denude its fleets of aeroplane co-operation, which would be largely the case if the carriers were on detached service. Probably, however, an enemy well knowing our Achilles heel would consider that the importance of commerce destruction outweighed other considerations, and therefore launch the carriers against our shipping. It might be argued that these vessels, by reason of their large target area and comparatively weak gun armament, would be easy prey to light cruisers; but "first you have to catch your goose"—the difficulty of this was shown in the case of the *Emden*—then you have to undertake "the cooking of the goose." This might well be found to be a tough job, as the aircraft carrier can develop immense hitting power

by the employment of her bombing and torpedo aeroplanes at ranges far in excess of the cruiser's artillery. I think the majority of experienced people would consider that the cruiser would be seriously damaged, if not sunk, before she got within gun range of the carrier. The correct strategy is undoubtedly to build a number of small carriers instead of a few large ones. The Americans have come to this conclusion; doubtless, other nations will follow these lines. When relations between nations get strained, the enemy will dispatch a number of these carriers to cruise in the selected areas, where they can begin operations immediately war is declared. The most efficient antidote to the carrier is to hunt for it with a similar vessel, as thus we shall have equal scouting range, also ability to launch bomb and torpedo attack at long range. It therefore seems that our battle squadrons must sacrifice to a certain degree our carrier strength, which should be stationed in peace-time in close proximity to our main trade routes ready to clear the seas of the enemy's carriers or at least to hamper their operations.

The auxiliary carrier, by which I mean a vessel which is rapidly adapted from existing types of merchant ships, will play a big part in commerce destruction, and to a lesser degree in protection. In these days of ships with internal combustion engines and the rapidly gaining popularity amongst foreign Powers of using aeroplanes and seaplanes flying off mail steamers, the conversion of these ships is a much simpler problem than is the case with steamers. The setting loose on the trade routes of a number of these vessels, each carrying a few aeroplanes, is a serious problem that cannot be lightly set aside, especially as these vessels will be legitimately carrying aeroplanes in their ordinary civil vocations. No doubt the majority of them will be compelled to use seaplanes, as at the present moment a clear flying deck is required for deck alightments, although ascent can be easily accomplished by the provision of a short runway or by means of a catapult. This will reduce their scope to fairly calm weather.

There is no reason why a possibly future hostile nation should not construct a number of merchant ships with flush upper decks, as the future trend of ship design will permit of vertical funnels being abandoned. They would thus possess a number of embryonic carriers. The large airship can, of course, be used as an aeroplane carrier: several experiments of this type of work have been made public both in this country and America; but I doubt if the airship can ever be a serious war machine, as they are practically helpless when within reach of aeroplanes. At least, this is the view of the aeroplane man, although the airship people hold other views.

The last method, using large flying boats, is no doubt a promising field. These vessels—and they can be rightly termed flying vessels—

will work either from an established base or from sea-going tenders lurking in unfrequented localities. The everyday advance in the capabilities of flying boats must make every student of warfare alter his views on their utility. To repeat myself, I again refer to the latest German production, the Dornier DO.X., which has 12 engines of about 500 horse-power, and has flown carrying 169 people.

The Junkers' firm have now produced a smaller craft with two engines of 800 horse-power and two of 400 horse-power; but this craft has certain advantages over the DO.X. as the engines are housed within the planes. This is undoubtedly the correct method of installation, as, by this means, parasitic head-resistance is reduced, and access to the engines can be obtained in flight far more easily than with exposed engines. Reduction in the number of engines will soon be obtained by the introduction of new types with a greater horse-power output. It is obvious that the less engines for the total required horse-power you have, the better will be your performance. It is absurd to think that these German machines have reached the high-level mark of size or performance; vast strides will be made now the lead has been given.

The death of Commander Porte was an undoubted blow to the advance of flying boats in this country. He was a man of great energy and vision, whose services were practically unrewarded. His widow received a most meagre sum from the Government. It must be remembered that he designed the 135-foot span five-engined Felixstowe Fury that flew in 1919. It is a fact that stagnation occurred after his death.

With these few remarks about flying boats, it is evident that we must expect in the near future that these craft can carry a good load of warlike weapons—bombs, guns, or torpedoes, probably an assortment of all. Two or three of these craft working from the Maldives or Laccadive Islands would play havoc with the Indian Ocean trade. These flying boats will be most difficult targets for fighter aeroplanes to attack, as presumably they will carry a very powerful machine gun armament. I do not, however, intend to go into the question of air fighting, as this is particularly a service matter, and I might be tempted to discuss information I have gained through my service experience.

I have now mentioned the main lines of ocean attack on merchant ships. There are, of course, several others, but the ones I have written about are sufficient to demonstrate that we must be prepared for a bad time. The question now arises: How are we going to defend our merchant ships?

Surely we cannot afford to leave this important question to be solved in our ordinary British way of waiting until the situation gets serious before acting.

There is no weapon so rapid in its execution as the aeroplane. We

have the words of that great soldier, the late Marshal Foch, who pointed out this fact; therefore to counter it we must have well-laid plans, capable of being put into operation as soon as hostilities begin, otherwise serious risk of defeat looms in the offing.

Two features stand out: (1) Our ordinary peace-time naval routine of policing the trade routes with cruisers is entirely useless against air attack; (2) the cover provided for our trade by our capital ships is inoperative in the same case. History proves that we must follow the usual main lines to achieve success: (*a*) Cover, (*b*) convoys adequately escorted, (*c*) raiders swept off the open seas, (*d*) the channel kept clear of privateers. The cover will no doubt be provided by the presence of our aircraft carriers reinforced by cruisers patrolling focal points of our trade routes.

The convoy, with its escort, is a very ticklish problem. If the escort is not efficient, it is far better to do away with convoys and trust to routing and dispersal. It is imperative that we should attempt to solve this question of convoy and escort, and I will try to do so.

First, we must instruct our mercantile marine officers by the aid of short courses, and by literature, on the methods to be employed to defend their ships and the types of air attack they will have to meet.

Secondly, we must be prepared at our home and main Colonial ports with adequate armament, and a certain number of active service personnel ready to embark upon our merchant ships.

Thirdly, we must have on foreign stations a certain number of properly designed escort ships.

Working on these main lines we may achieve some measure of success, which experience should develop into efficient defence. The armament required is undoubtedly an anti-aircraft gun for each ship, with special instruments. One active service rating with anti-aircraft training is an absolute minimum per ship. In many merchant ships there may be a difficulty in mounting the anti-aircraft gun so that a clear field of fire is obtained, and this can only be found out by tests. As I have mentioned previously, internal-combustion driven ships, which have certain advantages, are now being built in large numbers.

Organization of the convoy's anti-aircraft fire is an essential for success, as independent fire from each ship will be of little use; therefore some system of fire control must be organized. In a convoy of twenty or more ships, fairly good results could be obtained by each ship being given a certain altitude at which to open fire. In certain ships of the convoy an experienced officer should be carried, who would be responsible for the fire of the ships. Certain steaming formations, which experience will prove advisable, will undoubtedly be discovered.

Escort vessels of a specialized type are absolutely essential. This is a most important matter, as, unless the vessel employed is suited for the

work, she is practically useless; in fact, a danger. The ship suggested is of fairly small size, probably slightly larger than a sloop, with internal-combustion power plant, and a clear upper deck on which are mounted anti-aircraft guns and anti-aircraft searchlights. A certain number of the guns should be capable of horizontal fire in order that they can be used against submarines or surface craft.

It is desirable that the escort ship should carry a few fighter aeroplanes; but this might be difficult to arrange for in view of the Washington Agreement, which limits total carrier tonnage. There seems no reason why a number of these ships should not carry out the ordinary peace-time routine work of the Royal Navy on certain foreign stations, like the Persian Gulf. They could certainly carry out the same type of work as is done by the sloops, with the advantage of being of great assistance in war, whereas the sloop is practically useless. The convoy would then have some hopes of beating off aeroplane attacks.

Defence against night attack will be difficult to arrange, and it seems that night passage through dangerous localities should be avoided. Smoke screens may be of utility by day, but smoke is a two-edged tool, and it might blanket our guns more than it interferes with the aeroplane.

The problem of our channel traffic would be immensely simplified if we could divert practically the whole of it to West Coast ports; but this is impossible as the internal economy of Great Britain is so specialized and our communications and distribution arrangements so bad that we could not close London as a port without causing practical starvation to the large area it serves. In addition, our West Coast ports could not deal with the increased cargo volume.

Finally, it is certain that we cannot afford to go to war totally unprepared to defend our merchant shipping. The aeroplane will strike hard, and strike rapidly, thus allowing us little time to instal countermeasures. Whilst we all desire universal peace, and very few of those who fought in the last war would like to go through it again, we must, until war is made impossible, be prepared to face the problem of our very existence, and the sooner we do so, the better shall we be prepared.

SOME PROBLEMS IN CONNECTION WITH THE PREPARATIONS OF AN AIR FORCE FOR WAR

BY WING-COMMANDER M. HENDERSON, D.S.O., *p.s.a.*, R.A.F.

THE preparations in peace of an Air Force for war present many interesting and novel problems, and, in contrast to the other arms, practically no history is available to assist in the solution of these problems. This is due to the fact that at the beginning of the last war (1914-1918) air power was in such an early stage of development, and its equipment so primitive, that it could not be considered as anything more than a very weak auxiliary to the other arms. The rapid development which took place during the war, however, led in 1918 to the formation of the Royal Air Force.

The purpose of this article is to point out some of the more important problems which this development has brought about in the peace preparations necessary for the full utilization of air power in war. Before examining the problems in detail, it may be of interest to point out some of the characteristics of air power and the way in which these differ from those of the other arms.

These characteristics are briefly as follows:—

(i) Extreme tactical mobility, within the limits of endurance of the aircraft employed.

(ii) Ability to operate unaffected by the physical configuration of the ground.

(iii) Powers of rapid concentration and deployment.

From an examination of these characteristics it is obvious that air power, properly organized and fully prepared in peace, can, on the outbreak of war, be brought into operation much more quickly than either of the other services, and, by developing an early and vigorous offensive against the enemy, can cover their concentration and deployment. In order to be in a position to carry out this offensive effectively, the Air Force must, in peace time, be kept at a very high state of efficiency both in trained personnel and equipment, and it is the supply and the maintenance of these two essentials which form the problems for examination in this article.

Personnel.

(i) *Ground Personnel.*

Regular.—It has been shown above that the peace and war establishments of flying units must be practically identical. It follows that few reserves need be held to bring them up to war strength.

The war wastage among this personnel will be small and will be caused principally by sickness. Replacements will therefore present no difficulty.

Reserves.—Reserve personnel will be required to form new units, as an expansion of the Air Force after the outbreak of war must be considered. Such an expansion will probably be very gradual, owing to the difficulty of rapidly equipping such new units, as will be shown later.

A reserve of ground personnel can be built up by passing regular personnel to the reserve after a period of service with the colours, and calling them up for trade test and, if necessary, for "refresher" training periodically.

Most of this class of personnel will, on completion of colour service, find employment in civil trades requiring a type of skill and knowledge similar to those in which it has been employed in the Service, and besides being available to make good the small wastage in regular units this reserve will be available to man new units formed after war breaks out.

A further source from which ground personnel can be drawn as required is the great body of skilled tradesmen employed in the aircraft, motor, engineering, ship-building, and iron and steel industries. At the same time, it must be remembered that in a national war—one in which the full resources of the country are employed—a great proportion of these tradesmen will be required in their normal peace employment, since all the industries mentioned above will be fully employed on the production of munitions and other essentials for the prosecution of war.

Some scheme for the dilution of this skilled labour with semi-skilled or female labour may be necessary in order to liberate a proportion of the tradesmen essential for the Air Force.

Moreover, the other services, both of which are in need of skilled tradesmen, will also have a claim on a proportion of the skilled labour available in industry.

(ii) *Flying Personnel.*

The supply and training of flying personnel in peace time present few problems of importance which are not common to all the fighting services.

The problem of making good wastage due to flying accidents is a minor one and will become less important as design and knowledge of what is still a comparatively new vehicle become stabilized. The supply of flying personnel in war, however, presents a very difficult problem.

A high rate of wastage appears inevitable in any air war between first-class powers. During the last year of the war 1914-1918, when air warfare on the Western Front became intense, the monthly wastage figures were in the neighbourhood of 50 per cent. per month for pilots, and only slightly smaller for observers and gunners. With the improved equipment and more intensive training now available, and consequent increase in air fighting, it is certain that these figures will be exceeded in future wars, and it is obvious that if the offensive is to be maintained big reserves of flying personnel must be available to make good the heavy casualties.

The building up and maintenance of such a reserve in peace time is one of the biggest problems with which the Air Staff has to deal.

It is necessary to point out at this stage, that reserves held in peace must be sufficient to make good wastage for at least five to six months, since this is the minimum period required to train a war pilot, even under the most favourable conditions.

The most obvious method of building up this large reserve appears at first to be by taking flying personnel for a short period of service with the colours, and, when fully trained, passing them to the reserve and replacing by fresh personnel. This method is being employed by us and France, but although it undoubtedly helps towards a solution of the problem it has several disadvantages.

Flying personnel requires constant practice and continual training if it is to remain efficient in flying duties, and it is very difficult to provide reservists with either under existing conditions. Financial considerations make the provision of large formations for dealing with reserve training impossible, and modern social conditions make it difficult for reserve personnel to give much time to annual training and "refresher" work.

In the present state of civil aviation, only a negligible percentage of this reserve personnel can be absorbed into this branch of flying, nor can civil aviation at present provide much in the way of flying personnel on the outbreak of war. This source of supply will, however, grow in importance and value.

The "short period with the colours and long period with the reserve" system, while workable with a country enforcing conscription, has further disadvantages to a country which recruits its fighting services by voluntary means, as we do.

Flying personnel must be young (between the ages of 18 and 25 is

best) and it is difficult to attract the right material to join for a short term of service at an age when the average man is just starting on a career in a life in which, under present economic conditions, competition is keen and success often goes to the early starter.

A source of supply which, although still only in embryo, is growing quickly, lies in the flying clubs which are forming all over the country. In these clubs it should be possible not only to train new pilots but also to give a proportion of the reserve personnel the necessary flying practice at a time and place most convenient to them. The Government subsidy granted to certain clubs in this country must be considered as money well spent.

The problem, so far as personnel is concerned, may therefore be summarized as follows:—

(i) The supply of ground personnel presents no difficulty and can be dealt with satisfactorily from existing sources.

(ii) The supply of flying personnel can only be adequately met by the maintenance of a large reserve and by the provision of facilities in peace time for keeping this reserve in such training that it is available immediately upon the outbreak of war to take its place in the first-line units, to make good the inevitable heavy casualties.

Aircraft.

Wastage.

The wastage rate in aircraft due to ordinary peace-time training is small and easily replaceable.

The wastage figure in war, however, will be very great, and the making good of this wastage and the provision of adequate reserves to meet it is one of the most complicated problems with which an Air Staff is faced. It is no exaggeration to say that it is second in importance only to that which confronts them in the supply of flying personnel.

It is not possible to give an estimate of this wastage in terms of figures, but it is safe to say that a loss of 50 per cent. per month in aircraft must be allowed for at the very least. Moreover, the heaviest losses will probably occur at the beginning of the operations, when both sides are making great efforts to obtain an early decision.

It is obvious, therefore, that steps must be taken in peace time to assure an adequate supply of reserve aircraft being available to make good this wastage at once.

At present the source of supply for aircraft in practically all countries is limited by the fact that orders for civil aircraft are extremely small,

the industry being dependent for its existence largely on orders for Service aircraft, and such orders, owing to the rapid development of new types and the small wastage in peace, are also small and spasmodic. An industry, working under such conditions and with no assured market for its products in the future, obviously cannot lay down expensive machinery to prepare for a very nebulous mass-production programme in the event of war.

Moreover, even were it able to do so, the rapid change and development in type, which will certainly continue for many years yet, would necessitate constant change in such equipment and a consequent outlay in capital quite beyond the capacity of the industry. While the demand for commercial-type aircraft is increasing steadily as air routes are developed, the number of aircraft employed on such work will be small for many years to come, and only a small proportion of these are suitable for employment in air warfare, a proportion which is likely to become negligible in time. It may be asked at this stage, why cannot the Air Forces themselves build up the necessary reserves of aircraft in peace time?

The reasons are many.

The rapid development in design, and consequent change of type, would necessitate frequent scrapping of such a reserve and a big financial outlay on modernizing it. Such an outlay is absolutely prohibitive, and no Power is willing to face it so long as the present world-wide financial depression lasts. Moreover, even if the necessary financial provision could be made, the necessary accommodation for storing such a reserve would necessitate an immense building programme and an expensive maintenance staff.

Before such a policy is adopted, therefore, it is as well to examine the problem further to see whether any alternatives exist.

The necessity for some degree of standardization of type is obvious. It may be necessary to sacrifice efficiency to a certain degree to achieve this, by standardizing a type for a certain number of years and accepting the risk of development during that period rendering the standardized type obsolescent.

The adoption of all-metal construction will go far to make this standardization possible by lengthening the life of aircraft. Once such standardization has been adopted a peace production programme can be laid down for several years ahead.

The benefit of such a scheme to the aircraft industry in general is obvious. With an assurance of definite orders for a fixed number of years ahead the industry should be able to attract new capital, develop plans for expansion and also develop its research and experimental branches. By thus building up a strong aircraft industry in peace the country can be certain of being able to produce quickly the great

number of aircraft required on the outbreak of war, while at the same time reducing expenditure in peace time to a minimum.

It is not proposed to go further into this question of standardization and organization of the aircraft industry now. The problem is a big one and raises many side issues, but it seems obvious that sooner or later it must be faced by any country which possesses an Air Force as part of its organization for national defence.

To summarize, the solution of the problem of the supply of aircraft to make good the high war wastage which is inevitable at the commencement of air operations seems to lie in the organization in peace of a strong aircraft industry capable of rapid expansion in war.

SOME NOTES ON PREPARING FOR THE STAFF COLLEGE

(*Continued from Vol. I, No.* 1, *p.* 16.)

BY WING-COMMANDER R. GRAHAM, D.S.O., D.S.C., D.F.C., *p.s.a.*

II.

READING.

Read not to contradict and confute, not to believe and take for granted, nor to find talk and discourse, but to weigh and consider. —FRANCIS BACON.

IT has been stated that a Staff Officer should cultivate the power to form and express opinions on problems, basing his opinions on a knowledge of the causes governing the problems. This knowledge may be obtained from observation, reading, discussion, contemplation and imagination. Though these sources of knowledge are closely related, each plays its own particular part in developing the mind. For the purpose of this article, reading will receive the most attention, but this does not mean that the other directions in which knowledge may be sought are less important. Reading will be of little value unless combined with discussion and contemplation.

Books are read for pleasure, for information and for guidance in style. The extreme examples of these categories of reading may be taken as the detective story, the Service Manual and the Classic, or Edgar Wallace, The King's Regulations and Air Council Instructions, and the Bible.

Quite often one book, usually a biography, covers all these categories.

Reading for pleasure is a personal matter, but one should cultivate the habit of reading books by good writers, because they give the best guidance in style and supply sound knowledge. The following list of twenty-five books may be useful to those who are unable to make up their own minds. Recent books and novels have not been included because they can be selected from the various reviews that appear in the weekly papers and Service journals. Valuable time can be saved by a careful study of the literary reviews before selecting a book to read.

TWENTY-FIVE BOOKS.

Essays:	
Selected Essays	A. Birrell.
On Compromise	Lord Morley.
Virginibus Puerisque	R. L. Stevenson.
Outspoken Essays	W. R. Inge.
On Liberty	J. S. Mill.
Literary Studies	W. Bagehot.
Biography:	
Burke	Lord Morley.
Letters	Charles Lamb.
Life of Lord Macaulay	G. O. Trevelyan.
Autobiography	Gibbon.
Life of Charles XII	Voltaire.
Travel:	
Eothen	Kinglake.
An Inland Voyage	R. L. Stevenson.
The Playground of Europe	Leslie Stephen.
History:	
Cycopædia	Xenophon.
American Speeches and Letters	Burke.
Anthology of British Historical Speeches	
British History in the XIXth Century	G. M. Trevelyan.
The Martyrdom of Man	Winwood Reade.
Novels:	
Rasselas	S. Johnson.
Tom Jones	H. Fielding.
War and Peace	Tolstoi, trans. C. Garnett.
Fathers and Children	Turgenev.
Pride and Prejudice	Jane Austen.
Villette	C. Brönte.

Before attempting to read for guidance in style, one should study a book on the subject. "Style," by the late Sir Walter Raleigh, is recommended.

To study style it is necessary to analyse the author's method. Consider how he has arranged his matter, and the manner and manners in which he expresses it. Examine the grouping of his facts; the way in which he has worked logically and naturally up to a climax. Study his vocabulary. Make a note of new words, together with their true meaning. Check obscurities, and note how in the best writing every sentence means only one thing; there is no hint of ambiguity. Study also the value of the short sentence, the short word, and English idioms of force. For the purpose of writing Staff Papers one cannot do better than study Macaulay. He was a past-master in the use of short sentences.

When reading, it is important to have good reference books close at hand. The following are recommended:—

The Oxford Dictionary.

A Dictionary of Modern English Usage: H. W. and F. G. Fowler.

The King's English: H. W. and F. G. Fowler.

Reading for information must necessarily cover a large field. First,

there are the current problems, fully reported in the daily press and the various periodicals. *The Times* is undoubtedly the best paper to read; its news is accurate and considerably in excess of any other daily paper, whilst its style is in keeping with that required of a good Staff Officer.

The leading article in the *Financial Times* also provides a useful summary of the important day-to-day happenings throughout the world, whilst the popular papers deserve a cursory glance.

The best way to deal with *The Times* is to look through it carefully every day, reading and studying the important news. Certain articles may be worth filing; these should be cut out and placed in envelopes with other information on the same subject. It is important to keep the cuttings within practical limits, and therefore the envelopes should be cleared at frequent intervals. *The Times* is filed in most libraries, and therefore a short reference in one's card-index will be sufficient more often than not. If an article is likely to be useful for reference purposes, a precis should be made. Particular attention should be paid to articles on Naval, Military and Air matters, more especially the Parliamentary debates on the Estimates, because these give valuable indications of policy.

It is a mistake to spend much time reading and trying to understand a complicated article on a subject not previously studied. The article should be filed and referred to later, when the essential groundwork of the problem has been mastered. Many of the current problems will have to be treated in this way, the candidate going back to an earlier periodical or text-book for a summary of the whole.

The periodicals provide excellent summaries of the important news that has appeared in the daily Press. In addition, they provide articles on subjects of current interest. In this respect the Service journals, such as the *R.U.S.I. Journal*, the *Army Quarterly*, and the *Royal Air Force Quarterly* provide information on every Service subject. They are invaluable and deserve the closest scrutiny.

Current problems are constantly becoming history. Therefore history may be taken as the next important direction in which to read for information. " To-days " become " yesterdays " and the change is marked by the advent of new books, a selection of which should be read. The value to be derived from them will be enhanced if one has studied previously an earlier book on the appropriate subject. Some form of groundwork, no matter how meagre, is always useful.

History is so wrapped up in personalities that it is difficult to divorce it from biographies. Biographies provide the means by which to study the personal characteristics, individual qualities, and special talents of the great men and women of the past. They supply the answers to the difficult problems of leadership, morale, discipline and personality.

In them one finds example, valuation of self, aim and interest, endeavour, self-confidence, method; in fact, all the qualities that make for efficiency. They provide a wealth of knowledge. The study of biographies is, without doubt, the next best thing to practical experience, and should form part of an officer's general routine.

The Service Manuals are the foundation for study. All other knowledge should be considered in relation to the principles and directions laid down in the official publications. This implies a high degree of professional knowledge in the first place. Here the officer of to-day is particularly fortunate, because text books abound and provide guidance in every sphere of his activities. It follows, however, that these books must be read in the spirit in which they are written; as a guide and not as an immutable law. At present, there is a tendency to interpret instructions too literally, with the result that the importance of decentralizing responsibility is often overlooked. Then people cease to think, and set up in rivalry to the local Post Office. "Forwarded to you, please" becomes the limit of their power of original thought. To nourish a baby one must exercise thought and care; to pass on the baby for another to nourish is to shirk one's responsibility or to admit that one has not the necessary ability.

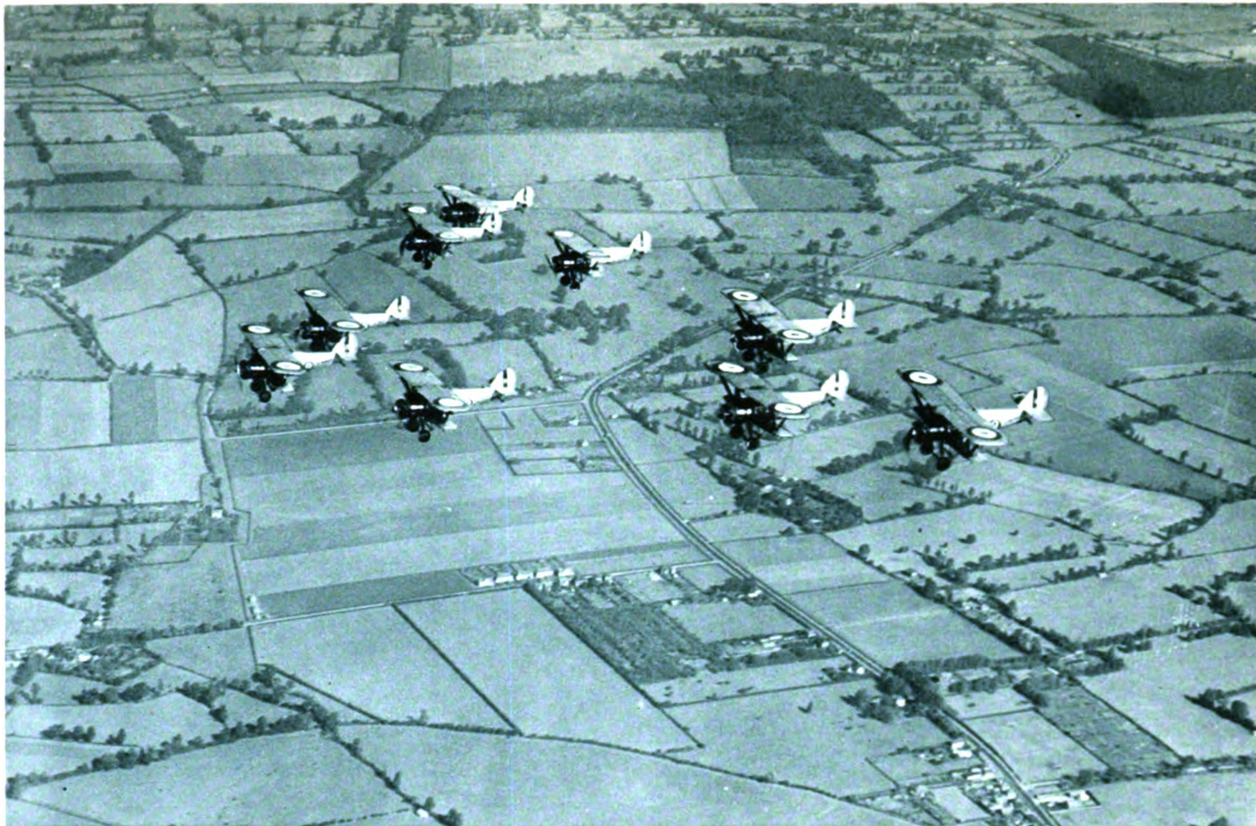
How to Read.

Read, mark, learn and inwardly digest.—Francis Bacon.

The first step towards useful reading is to become familiar with the roads into a book. These are the introduction, the summary of contents, the index, and the chapters and marginal headings. To make the best use of a book one must make the best use of the sign-posts dotted along these roads.

The introduction is of particular value as a guide to a book, because frequently it is written last. It is based on the finished book and usually sets out very clearly the author's purpose. Every good book has an aim, for one cannot write intelligently without one, and unless that aim is appreciated at the outset, much of the value of the book will be lost. It is surprising how many people read through a book without looking at the introduction. If they cannot follow the book, it is a "stupid book." They fail to appreciate that it is usually their own stupidity that is to blame. Let it be a rule that the introduction must lead the way into a book.

Many books have full chapter headings and marginal notes. These are usually collected together in a table of contents which is very useful in text-books on historical or military subjects, because it facilitates revision. When a general revision is all that is necessary a profitable half-hour may be spent in running through the summary of contents in a book.



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Formation of Siskins

(No. 29 (FIGHTER) SQUADRON)

The index is the means by which particular points are traced. It requires no explanation, except possibly a warning not to cultivate the bad habit of thumbing pages to find a particular passage. The index is the correct avenue of approach. When using an index it is well to remember that the items can be classified under more than one letter. One should try every reasonable entry before giving up the search.

The roads into a book are labour-saving devices, and can be adapted to almost any need; the secret of success lies in using them intelligently.

Finding one's way into the book is only half the problem. The other half is how best to " mark and learn," so that one may " weigh and consider." If the book is the reader's property, he may mark the pages to bring out the key ideas. This would be following the author's train of thought, which is not necessarily the reader's. The better way is to make notes. First read the book as a whole; then read it in parts, picking out the main ideas and building up facts and illustrations that support them, remembering the value of quotations. It is not sufficient to have notes on a book; they must be the reader's own work. The making of notes is an exercise of judgment and critical faculty, whereas studying the notes of others usually resolves itself into learning them by memory, and provides but little profit. Of course, comparing notes is a useful exercise, but better result would be achieved by discussion.

More often than not a book is studied with a particular object in view, then the notes need not be long. In many instances the barest of references in one's card-index should suffice. Note-making must depend on individual requirements and judgment.

Reading and note-making become easier with practice. If they are a little irksome at first, one should remember that the muscles of the mind gain fitness just as the bodily muscles do after the initial stiffness of the football season has worn off. There is also consolation in the thought that " there is nothing you cannot have if you want it enough."—*Disraeli*.

Reports on campaigns, despatches and similar documents must necessarily form a large proportion of the reading done in preparation for the Staff College. When dealing with these, one should go deeper than the general narrative of events. The importance of studying campaigns lies in deducing lessons and not in learning details of dates, distances and numbers. Such details are only of importance inasmuch as they concern the lessons of a campaign. It is not sufficient to accept the statements of other writers with regard to the lessons to be learnt from a campaign. Each student should analyse the campaign for himself and draw his own deductions. Naturally, he should be guided by what others with more experience than himself

have to say, but he should remember that human affairs are constantly progressing, and the lessons of yesterday may have a different significance to-day. This is particularly marked in a new Service like the Royal Air Force, which has relied for much of its doctrine on the lessons drawn from the past experience of the Navy and Army.

The amount of reading is a question that can be solved only by individual candidates. The answer lies in the lay-out of one's studies. Having decided upon the time available for study and the allotment of subjects to that time, the prospective candidates must next select an appropriate bibliography. It is better to study a few books thoroughly than a lot of books sketchily. A suggested bibliography, based on the Staff College Syllabus, is given at the end of this article. It is intended as a general guide only, and it will require frequent revision, because new books are constantly being published, especially on subjects affecting the Royal Air Force.

A certain amount of general reading is desirable, in addition to the books shown. Besides providing useful relaxation, it helps to strike a balance and to keep a sense of values.

Discussion and Contemplation.

Conference maketh a ready man.—Francis Bacon.

Reading invariably impresses certain points upon the mind, some confused and some definite. These points are of little value until they have been tested and dovetailed into the knowledge that is already in the reader's mind. Discussion, which has been aptly described as collective contemplation, and contemplation, which might equally well be called discussion within oneself, are the two processes by which the knowledge acquired by reading is soundly consolidated and co-ordinated with all that has preceded it.

Discussion brings out other points of view, and in doing so prevents the mind from becoming too rigid. It is the means by which a student can confirm or discard half-formed impressions. It fixes the more important points in the mind, and provides further food for thought. The less time between the contemplation, whether collective or individual, of a subject and the reading of it, the more valuable will be the results, because impressions which depend solely on reading tend to be fleeting.

Apart from the knowledge to be gained from discussion, practice in talking and arguing with others plays an important part in preparing for the Staff College. A Staff Officer must be capable of conveying his thoughts by speech in a clear, concise and forcible or persuasive manner. He must not hesitate to speak, should the necessity arise, just as he must not fail to keep his own counsel when the occasion

demands. Practice in discussion will enable him to cultivate the art of speaking at the right moment, and saying the appropriate thing in the correct manner.

Little need be said about contemplation, for it is a matter that concerns the individual. This article is not the place in which to discuss its many applications. There is, however, one general point of interest which should be borne in mind. Random reflection, and this phrase embraces loose discussion, is a pleasant relaxation, but it is of little value for assimilating knowledge. For this latter purpose, contemplation must be analytical. The subject must be reduced to first principles, in a logical and orderly manner, each point in the process being firmly linked to its neighbour, so that all form a strong chain, with one end anchored firmly to a sound foundation, whilst the other connects to the particular subject under consideration.

The writer apologizes for repeating the following extract, which he quoted in Part I of this article, but it forms an excellent summary to these notes on reading and contemplation. "Candidates* must practice thinking over what they read in such a way that reading becomes a means of originating thought. They should then form the habit of expressing these thoughts in writing, because an idea which may seem fairly clear when thought about often becomes extremely illusive when an attempt is made to transfer it to paper."†

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* *i.e.*, officers preparing for the Staff College.

† Official Report on the Qualifying Examination held in September, 1926.

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(To be concluded.)

THE OFFICERS' ENGINEERING COURSE

By Wing-Commander G. W. Williamson, O.B.E., M.C., R.A.F.

Part I.

A permanent commission for suitable short service officers; a year's ante-date, giving accelerated promotion; an interesting yet thorough engineering training; two years at Cambridge University, an engineering degree, and two years' ante-date instead of one; a diploma exempting officers from the entrance examinations of certain institutions and societies; these are some of the prizes for students on the Officers' Engineering Course.

The course commences on August 1st in each year, and lasts two years—all too short a time in which to train an engineer; but it aims at instruction so interesting that the equivalent of three years' workshops and Technical School lectures shall be absorbed by the students without strain or cramming.

Accommodation and instruction are arranged for a maximum of sixty-five to seventy students, including officers from Dominion and foreign air forces. About thirty Royal Air Force officers enter annually; a First Year Course and a Second Year Course run concurrently.

Intensity of instruction would be impossible without an ample staff. The present establishment allows one Wing Commander, two Squadron Leaders and four Flight Lieutenants, all Engineer Officers; most of the Officer-instructors are qualified "E*." There are three Education Officers in addition. Classes in theoretical work are often only of seven officers each, permitting individual instruction amounting to coaching. Fourteen students in a class, as distinct from a lecture, is a more usual number.

The workshops are equally well staffed. First year officers occupy the shops in the mornings and second year the afternoons. The instruction is carried out by sixteen civilian instructors. The instructors have been specially selected for their skill and long trade experience; they are all ex-Service men, as are most of the other civilian employés.

Selection of Permanent Officers.

Officers for the course are normally selected between their second and fifth years of service, the large majority becoming students in or about their fourth year of commissioned service. Even while cadets are

under training at Cranwell, they are encouraged to direct their interests to one of the specialized subjects; and those who are keen on mathematics, mechanics, and engineering subjects generally, are very suitable candidates for nomination then for posting to the Officers' Engineering Course about four years later, provided that they are still recommended. Officers who enter the Service through a university, particularly if they have taken an engineering degree, are also suitable.

Short-Service Officers.

Annually, in December, an examination is held under the provisions of A.M.W.O. 630 of 1926. Short-service officers competing must be under 26 years of age and have completed three years' service on a short-service commission. After the examination, a list of candidates, in order of merit, is published by the Air Ministry, and about twelve short-service officers from the top of the list are posted annually to the Officers' Engineering Course. If they make satisfactory progress, at the end of their first year they are granted permanent commissions.

Ante-Date.

In common with other specialist courses, the Officers' Engineering Course carries an ante-date for promotion of one year for those who successfully pass it. In addition, five or six of the best officers of each year are selected to be sent for a two years' Honours Course in Engineering at Cambridge. Only those officers who are strong in mathematics and mechanics can qualify for this course; but if successful in taking their degree (and up to the present there have been no failures) they are granted the qualification "E*," and obtain a further year's ante-date.

Situation.

The course is at present accommodated at Home Aircraft Depot, Henlow, in order that student officers may have as close an association as possible with Service engineering.

A fully equipped gymnasium is provided, with a staff of qualified physical training and gymnastic instructors. There are also admirable facilities for tennis and badminton; and squash courts are being erected by the Mess. Fencing (épée and sabre), single stick and bayonet are well looked after by a Royal Air Force and Inter-Service Champion.

Henlow invariably has officers and men representing their Service, country and county in some sport or another. These include several Engineering Course students, who play with the Station teams.

Working Days and Leave.

Although stress has been laid above on Mathematics and Mechanics, it must not be thought that the general work of the course is too advanced to be interesting. The working day is divided into half for lectures and half for workshops; and whether the instruction is in a class-room, a laboratory, or at a bench, all the exercises and examples are given a strong Service bias.

To make sure that the lecture work is supported by the practical work, the details of every lecture and every workshop exercise are set out in full in the Annual Syllabus, a copy of which is issued to every student. It is therefore possible for every student to see what stage he should have reached by a particular date, and for the lecturer or workshop instructor to ensure that his lectures or exercises have not fallen behind the time-tables.

The work is made more interesting if workshop exercises or laboratory experiments are properly co-ordinated, not only with the lectures given on the course, but with the visits, fifteen of which are made annually to great manufactories, and with the weekly lectures delivered by Service or civilian experts.

Sixty-one days annual leave is spread over the year in such a way as to make suitable intervals between terms: five days in the middle of the first-term (mid-October), a fortnight at Christmas, a fortnight at Easter, and four weeks during July.

First-Year Lectures.

Lectures for first-year officers are in the afternoons, and cover subjects which are basic or preparatory for the Service work which is attempted in the second year. The aim is to provide the student with knowledge which has direct application to aeronautical engineering. The use of algebra, geometry, trigonometry, logarithms, slide rule, graphs, and calculus is taught solely to provide the mental tools with which the student may attack the more advanced work.

Lectures on metallurgy are reinforced by visits to steel works at Sheffield, and light alloy works at Birmingham. At a later stage of the lectures, the rolling of plates, strip and tubes of these metals is seen in the various factories, and when the lectures reach heat treatment and the structure of metals, students are able to carry out in the course laboratories a series of experiments in which change of structure can be followed with a microscope, or recorded by a micro-camera.

The course possesses an up-to-date drawing office, also fitted out as a lecture theatre. The earlier instruction covers the use and care of instruments, conventional methods, and different types of drawing in use in the Service. At an early stage, students are taught the same methods of development which are used at Halton for the instruction

of sheet-metal workers; and in the workshops they carry this drawing instruction into actual practice by making up branches, bends, junctions and other sheet-metal exercises.

First-Year Laboratories.

All the experiments in the laboratories are arranged to be useful as well as instructive. After chemical operations have been dealt with in lectures, students carry them out for themselves in the chemical laboratory; these include the determination of the hardness of water by more than one method, fractional distillation of petrols to investigate their properties, experiments upon oils in regard to their usefulness in internal combustion engines, and calorimetry of various fuels. Such experiments as these are not only useful, but interesting as well.

First-Year Workshops.

The new workshops have been equipped with all the machinery essential to enable a wide range of operations to be carried out. The system of workshop training has been satisfactorily commented on by the Central Trade Test Board and senior officers who have examined workshop exercises at the close of each year; and its intensity and the satisfactory results achieved were remarked upon by the Council of the Institution of Mechanical Engineers on their visit last year.

A group of six or seven students, upon arrival in any of the workshops for the first time, is given a lecture by the senior instructor before starting work, which deals with the care and use of the special tools involved, and the behaviour of the materials which will be worked upon. Practical demonstrations are given to show how the work should be carried out, and notes are usually taken for future reference by the students. As the exercises progress, becoming increasingly difficult and yet more useful, the student is always able to obtain advice from the instructors; but must carry out the work upon the job himself.

A series of standard exercises for each workshop have been laid down, and, as stated above, these are progressively difficult; the more useful ones may be retained by students at the end of the course. Where officers have had previous workshop experience, this is proved by a simple test; and they need not then carry out the more elementary exercises. To ensure that all points are covered in the carrying out of workshop exercises with unfamiliar tools and materials, a series of standard instruction sheets is being prepared, showing the tools required for each job, the method of setting up, material needed, time allotted for each operation, and mistakes to be avoided.

Wherever possible, students are employed upon actual productive work; the realization that their work will be used gives them a sense of pride and responsibility in it. Where an officer is successful

in completing the standard exercises in less time than that allotted, he proceeds to the production in that particular workshop of items of equipment which may be needed by that or other shops.

The thirty officers of each year are divided for workshop purposes into four groups of seven or eight officers each. Only one group occupies a workshop at a time, and as the more important workshops have at least two instructors, intensive individual training is possible.

All the workshops are used for first-year pupils not only for instruction in certain machine tool operations, but to give experience in the art of working different metals under varying conditions; and in the setting up of work with different combinations of tools and equipment.

Machine Shop.—Instruction in Machine Shop work for first-year students is given in the following sequence:—

Facing and surfacing.
Taper turning (external and internal).
Boring and recessing.
Screw cutting (external and internal).
Drilling and tapping in lathe.
Use of four-jaw chuck and dial indicator.
Use of face plate and angle plate.

Fitting Shop.—A series of fitting exercises teaches the use of hammer, chisel, files, straight-edge, square, scraper, drills, taps and parallel reamers, and leads up at the end of the first year to the remetalling, boring, and scraping of bearings.

Carpenters' Shop.—Although wood has almost passed out of use in the making of aircraft, it must still be regarded as an engineering material. Students commence in the Carpenters' Shop with a brief course of general carpentry; after they have become accustomed to the ordinary hand tools, especially in the making of joints, they proceed to exercises involving all the usual woodworking machine tools such as circular saw, planer, spindle moulder, various types of band saws, and morticing machines.

Having become accustomed to the behaviour of their material, wood, they proceed to the making of patterns for foundry work.

When the patterns are made, the officer takes them to the Foundry, and produces from them moulds in various ways. The castings from these moulds are then taken to the Machine Shop, where they will form exercises in machine-tool work.

Foundry.—The Foundry is equipped to give officers experience in casting various metals in box and floor mouldings, and in two different types of sand. The equipment includes wooden benches, trimming bench, Brayshaw gas furnace, gas stove, cupola, sand mill, and an emery wheel. In the Foundry, the officer learns something of the mixing of metals, in order to produce brass and other alloys.

Sheet Metal Shop.—The earlier exercises in the Sheet Metal Shop deal with simple cylindrical vessels such as a paint pot in tin plate, embodying various simple seams, ordinary soldering and a little riveting at the handle. The student proceeds to conical vessels, where the development is a little more difficult, and then to more difficult exercises leading up to second-year work.

Forge.—In the Smiths' Shop, officers are trained in the arts of forging and welding; all exercises lead up to the actual production from the raw material of blanks for parts actually used in the Service. Further instruction is given in constructional work involving cold and hot riveting. The shop is equipped with a drop stamp, and instruction is given in the production of drop forgings, and also in the use of the oil-fired furnace.

Second-Year Lectures.

Aero Engines.—Approximately 60 lectures, each of an hour's duration, are given upon the aero engine, auxiliaries such as carburettors and magnetos, and fuels and oils. These are supplemented by a series of lectures by experts, external to the course. The external lecturers include such well-known names as H. R. Ricardo, Esq., B.A., A.M.I.C.E., M.I.A.E.; A. H. R. Fedden, Esq., F.R.Ae.S.; Major G. P. Bulman, O.B.E.; Lieut.-Col. F. L. R. Fell, D.S.O., O.B.E.; and D. R. Pobjoy, Esq., B.Sc. The engine lecture work is taken in conjunction with a number of visits to aero-engine manufacturers' works, actual experimental work on engines in the Engine Research Laboratory, and the fitting and erection of engines in the Repair Shop. Running and testing the engines on the brake completes the training in aero-engine work.

Engine Laboratory.—The Laboratory is not yet fully equipped, but includes a single-cylinder variable-compression engine and an optical indicator. During the next course, for experiments on detonation, the students will manufacture a "knocking-pin" and its recording apparatus. The experiments include the determination of the compression ratio, the obtaining of indicator diagrams under various conditions, such as altered valve and ignition timing, and the effect of various fuels.

Fuels and Oils.—Chemistry in the first year led up to that kind of industrial chemistry which is of the greatest use to Service engineers. In the Laboratory devoted to fuels and oils, students carry out exercises in the determination of specific gravity, distillation curves, calorific values, flash points and viscosity, and gas analysis.

Metal Aircraft.—It is intended that the amount of instruction given on aircraft work should balance that on engines; and a similar series

of lectures, laboratory experiments, and shop exercises equip students with similar all-round knowledge, as thorough as is practicable in the time allowed. Production and repair methods are studied during visits to aircraft works which manufacture steel and duralumin aircraft, including flying boats.

The lectures include at least twenty on metal aircraft, metal construction and aircraft materials used on up-to-date machines. The Aerodynamic Laboratory will include a wind tunnel, made by the students themselves to the design of Mr. W. S. Farren, of Cambridge and London Universities; and an eddy motion tank, also made by members of the course. With this equipment it is possible to demonstrate basic principles in aerodynamics which would otherwise have to be dealt with by lengthy lectures or involved calculations.

There is, in addition, a series of twenty lectures on Elementary Aeronautics, co-ordinated as closely as possible with the laboratory work.

External Lectures on Aircraft.—External lectures in the past have included Aircraft Design, by W. S. Farren, Esq., M.A.; Control and Stability, by Prof. B. Melville Jones, M.A., A.F.C.; Development of Large Flying Boats, by Air-Commodore J. A. Chamier, C.B., C.M.G., D.S.O., O.B.E.; Installation, by Flight-Lieutenant C. H. Potts; and Performance, by R. S. Capon, Esq., B.A., F.R.Ae.S.

Electricity.—In the Service, electrical gear in general is the concern of the Signals Officer and not of the Engineer Officer; but it becomes evident, as Royal Air Force Equipment becomes more complicated, that engineers will be involved "willy-nilly" in the use, maintenance and repair of certain electrical equipment which has no bearing whatever on Signals work. It is obviously desirable that the officer in charge of a workshop should know something of the motors driving his shafting, and something of the dynamos producing the current. Electrical lectures, therefore, deal almost entirely with power electricity, the use of various power circuits; electric lighting and lamps, accumulators, batteries and the magneto.

Electrical Laboratory.—Similarly the Electrical Laboratory covers a wide range of experiments. A number of motors and dynamos can be run under differing conditions and with varied circuits; a switch board with its switches and resistances was made by the students themselves. Experiments are carried out on petrol-driven sets, accumulators, car lighting sets, various methods of ignition, and aircraft electrical equipment in general. At a later date, if policy develops in this direction, it is hoped to cover aerodrome lighting, alternating current work and bells and telephones. The Laboratory is already equipped with a complete plating and polishing plant, with which electro-deposition of various metals can be carried out.

Metallurgy.—The lectures on Metallurgy, like those in other important subjects, are supported by visits to various works. The processes and their theoretical applications are dealt with in the lectures. In the Foundry and Forge, the student can carry out some of these processes for himself on a small scale; in the Metallurgical Laboratory and Heat Treatment Shop, he can examine and microphotograph for himself the changes to structure resulting from various heat treatments. In the Strength of Materials Laboratory, he can determine whether or not his heat treatment has been successful.

Lectures, experiments and material tests deal with non-ferrous metals in exactly the same way as those on the various grades of steel and iron.

Mathematics and Applied Mechanics.—Mathematics and Mechanics are continued throughout the second year, but applied directly, as far as possible, to Service problems. In the first year, the student has been taught the use of logarithms, slide rule, and mathematical methods as tools of his trade; in the second year he learns how to use those tools to attack Service problems.

Strength of Materials.—The use of the Strength of Materials Laboratory has been referred to above; in addition, there is a series of lectures on testing of materials, covering a rather wider range of work than can be carried out by students themselves in the limited time available.

Technical Organization.—About twenty hours are devoted to technical organization in so far as it can be applied to the work on which students will be employed when their training has ended. The organization and administration of Depots is dealt with; the various Depot workshops are considered separately; and the lectures cover, in addition, the organization of technical staff work and that necessary for the training of engineer officers and airmen of the technical trades.

Second Year Workshops.

Machine Shops.—At the end of the First-Year Course in the Machine Shop, the pupil has used every form of accessory on the lathe; has become familiar with tool shapes, names and purposes, materials and cutting speeds, and should be well enough informed to undertake an intricate job on his own initiative, receiving, perhaps, only advice as to the best method of procedure. In the second year, the object is to familiarize the pupil with other types of machines, leading up to jig and tool work. The shop is equipped with a milling machine, capstan lathe, boring mill, planer, and broach. The instruction involves setting up, selection of tools to be used for non-cylindrical work, and the speeds at which to run. Precision instruments are used for all measurements.

Jig and Tool Making.—The Fitting Shop and Machine Shop work provide a base upon which instruction in the making of jigs and tools can be erected. The officers make such simple tools as taps, drills and reamers from the raw materials to the finished job; the heat treatment of tools requiring hardening is carried out by the officer himself. The making of gauges of all kinds, gear cutting, and the use of press tools forms the most advanced instruction given in this shop.

Heat Treatment.—The instruction in heat treatment comprises the microscopic examination of steels and other metals, and a comparison of micro-structures after different treatments. That is, the metal is examined as received and after it has been annealed, tempered and normalized from varying temperatures. Such physical properties as "temper-brittleness" can be illustrated; and the effect of variations of temperature on spring steels demonstrated. The equipment includes electrically heated furnaces and a series of optical pyrometers.

Sheet Metal Work and Metal Aircraft Repair.—The first of these shops necessarily leads up to the second one. More advanced pipe work is taught; and, in addition, the repair of aluminium castings, lead burning and joint wiping, and the white metalling of steel connecting rods not fitted with shells. More advanced acetylene welding is also dealt with.

The advanced sheet metal work leads up to metal aircraft repairs carried out on fuselages, aerofoils, floats and hulls. The work follows ordinary Service processes; viewing, dismantling, checking, framing, sleeving, plating, refitting and final check.

The usual rigging processes on metal aircraft are also taught; together with work which is common to wooden and metal aircraft, such as the preparation of fabric covers, doping, painting and patching.

Aero Engines and Test Bench.—The practical instruction on aero engines gives the pupil a thorough knowledge not of one type, but of parts and processes common to all types. Although several up-to-date makes of aero engines are available for dismantling and re-erection, they are used only as examples and not for detail work. The most important part of the engine instruction is the viewing of parts for acceptance or rejection; and their comparison with blue prints, tolerance charts, and modification orders.

The instruction in the handling of engines and tools, dismantling and erection of components, erection and timing of complete engines, follows the usual Service routine; erection instruction includes the use of internal and external micrometers, the three-point "Subito" cylinder gauge, slip gauges, vernier callipers, tooth calliper and height gauge. About three weeks are spent on the test bench in the actual running of overhauled engines. The engine is mounted on the test

bench by officers themselves. All tests are carried out on the Heenan-Froude or Heenan-Fell brakes; running faults, test conditions, power curves, engine inspection, bonding and screening, and maintenance in storage form only a small part of the additional instruction given at this time.

METHODS OF INSTRUCTION.

Co-ordination.—The syllabus of instruction has been made as wide as possible, and as deep as the time allows. Two whole years are not available, as the normal sixty-one days' leave is granted in each year, with the result that only twenty working months can be utilized.

The syllabus of the course shows as far as possible the work which an officer will be doing in any hour throughout the whole of the two years. The method of setting out lectures and shop work ensures the closest co-ordination of lectures with laboratories, and of both with workshops. To guard against the course becoming too theoretical, every lecturer has been provided with some duty in the workshops.

To ensure this co-ordination, and to make every detail of the course as interesting as possible to the student, the proportion of officer and civilian instructors to pupils must necessarily be high. The time of pupils is saved by providing them with a very full précis of every lecture; and the matter is made so interesting that it is easily retained in the mind without conscious effort. The provision of précis means that lengthy notes need not be taken by the student during the lecture, but written up afterwards.

Private Study.—Since it is not necessary in the evenings to write up notes of lectures, about four hours' work weekly is set for private study. Fortnightly in the second year an officer writes a short essay, covering some aspects of the engineering work he has been carrying out; this gives him practice in self-expression and arrangement of his material, and is an aid not only to examinations, but to the writing of clear and concise technical reports. Home work is assisted by the provision of an ample series of text books; and these are supplemented by course-produced pamphlets upon aspects of engineering not dealt with in existing publications. At the end of the second year, students submit essays stating the improvements they would suggest in the course; and these not only brighten the lives of the officer instructors, but sometimes produce ideas worthy of incorporation in the forthcoming year.

External Lectures.—The weekly external lecture to the whole course is given by a Service expert, a distinguished civilian engineer, or a University professor. A series of eighty lectures, to cover the two years' course, has been arranged; and each one of a wide range of subjects, all bearing directly upon Service engineering, is dealt with by a qualified officer or civilian.

Visits.—A series of visits is specially arranged so as to demonstrate on a large scale all the work which the students carry out in the workshop or laboratory. There are fifteen such visits in each year, covering in the first year preparatory processes, and in the second year the manufacture of complete engines, aircraft or components; one or two visits each year deal with organization rather than with engines or aircraft. Prior to each visit, the firm sends a typewritten outline indicating the processes through which their manufactures pass, and the more interesting points for which the students should look. Upon arrival at the works, a lecture is usually given by some senior member of the staff; and students are expected to take mental or other notes of the processes they see, so as to be able to make a brief report of the more interesting points on their return.

Examinations.—The examinations at the end of the first year are half theoretical and half practical, so as to give no undue advantage to the student who excels in one aspect, and not in the other. In addition, one-third of the total marks for the whole year is allotted to workshop exercises, drawing, laboratory work, and other material, theoretical or practical, produced by the student.

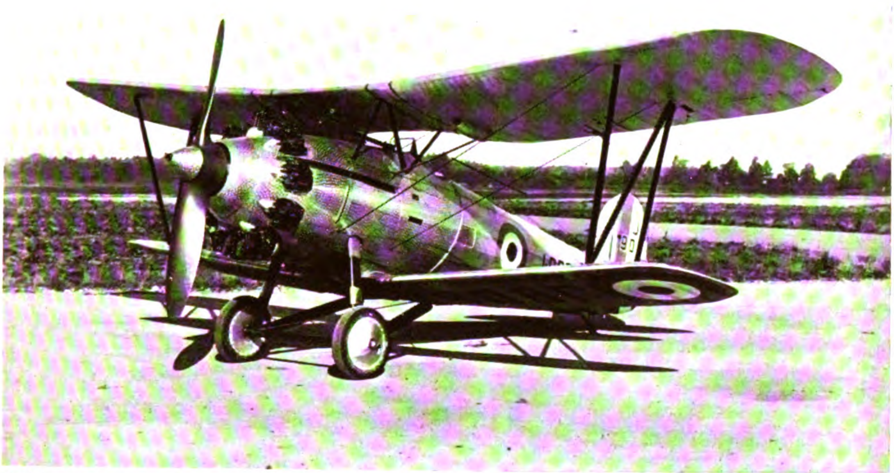
In the second year, with a greatly increased number of advanced subjects, examinations take place throughout the year as each series of lectures is completed; this leaves only a small proportion of examinations at the end of the year, and obviates officers having to work up data given to them for future use, and not necessarily for memorizing.

Post-Course Work.

Five or six officers are selected annually for a two years' course at Cambridge; officers who pass out sufficiently high to be selected for Cambridge, but who already possess engineering degrees, may be sent to London University instead, for post-graduate courses. A further five officers are posted annually to the Depot for one year, and therefore remain in touch with practical Service engineering. The remainder of the officers go to other technical stations for at least the first year or two after they leave the course, so that instruction given on the course will be applied to a sufficient extent to ensure permanent retention.

A wide range of interesting engineering employment is therefore open to the specialist officer; and it should be particularly noted that the Officers' Engineering Course is not a bar to a further course such as the Staff College; in fact, it has been officially stated that the possession of the symbol " E " or " E* "† will be taken as a positive recommendation for such another course.

† " E "—Qualified at Specialist Engineering Course. " E* "—Qualified at University Course in Engineering in addition to qualifying " E ".



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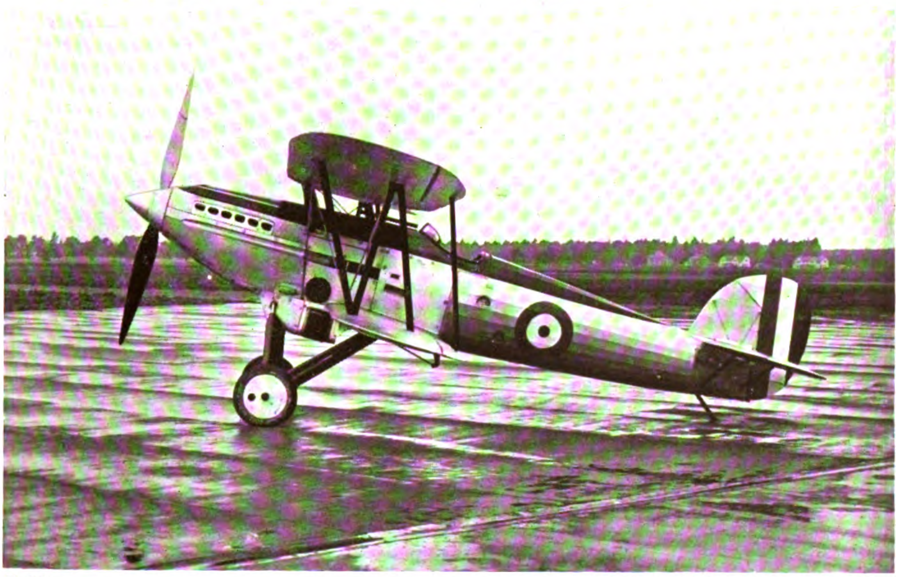
Bristol Single-seater Fighter, Bristol Mercury Engine.



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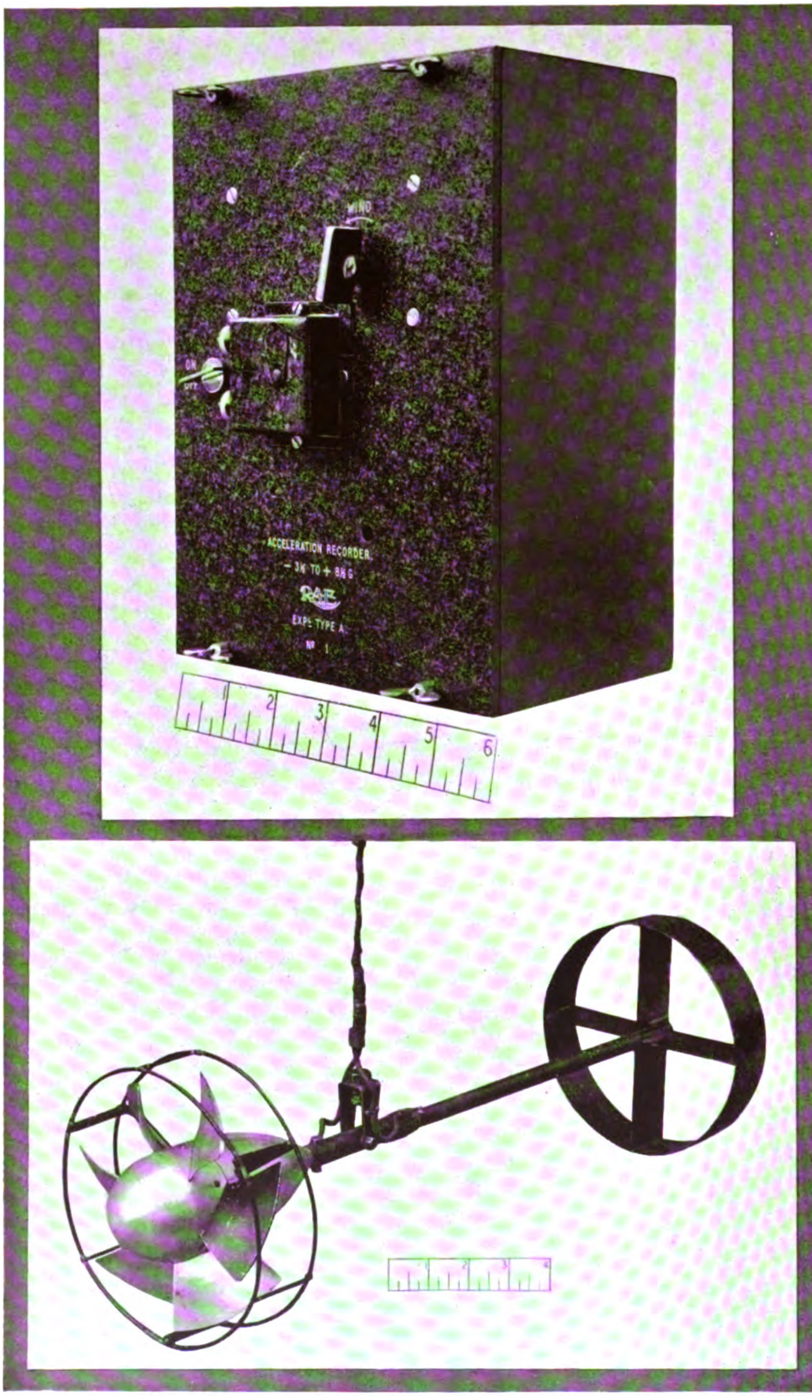
Fairey Single-seater Fighter, Rolls-Royce F.S. Type Engine.



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Top: Acceleration Recorder. Below: Suspended Air Log.

AERODYNAMIC RESEARCH FLYING

By S. Scott-Hall, M.Sc., D.I.C.

The term "research" implies, in its most general sense, careful investigation or experiment. Looked at in the light of this definition, research flying may be said to have started with the ascents of the first pioneers of aviation, James Sadler, Lilienthal, the Wright brothers, and all those other famous men who are associated with the early days of flying.

All work in any new science must be, of necessity, crude and somewhat haphazard until fundamentals have been established. It must be concerned more with qualitative results rather than quantitative measurements. The science of flight proved no exception. The very nature of flying in the early days, the short duration of the ascents, and the difficulty of carrying any surplus weight over and above that essential for lifting the aircraft and its pilot into the air, made any accurate measurements almost impossible. Moreover, the pilot was more than occupied with the handling of his craft, and could not find opportunity to take readings. Suitable instruments had to be developed, involving the expenditure of time and money, and of the latter there was an almost universal lack amongst these early pioneers, all of whom were private individuals.

In this country the starting of work on heavier-than-air machines at the old Balloon Factory at Farnborough marked the beginning of serious experimental flying on aeroplanes, and the first efforts to obtain detailed quantitative data on them, although work of a similar nature had been carried out previously on balloons and airships by the Royal Engineers. Amongst the names connected with this period, that of Edward Busk stands out prominently. Busk left Cambridge in 1908, and entered the Royal Aircraft Factory (now the Royal Aircraft Establishment) in 1912, as head of the Physics Department. He learnt to fly, and carried out much valuable work on the stability of aeroplanes.. In 1913 he perfected the inherent stability of the R.E.1, and with Colonel Brancker carried out a fifty-mile flight to Salisbury in May, 1914, without touching the controls. He was killed in November, 1914, through his aeroplane catching fire whilst flying over Laffans Plain.

The war period saw great aeronautical activity in every direction. It was at about this time that a definite split began between technical

development on the one hand and research work on the other. It is as well to define the spheres of action of these two branches of aeronautical work as they are regarded at the present day. The function of Technical Development is to produce new types of aircraft and equipment for them. The flying carried out under this heading includes all testing of these new types, and the measurement of their performance. This work is of paramount importance, but of equal, and perhaps more widely reaching value is that done under the heading of "Scientific Research." It is here that fundamental theories are explored, new inventions and ideas tried out, and the data obtained which is handed to the Technical Development side. Most of this work is carried out in this country at the Royal Aircraft Establishment, Farnborough.

It is difficult to dissociate the flying side of research with the investigations carried out on the ground. In aerodynamics much is done mathematically on paper, a little is done with free models, and a vast amount is done with captive models in the wind tunnel. There are certain branches in which the flying is essential, such as work on engines where the low-pressure chamber is unsatisfactory for the reproduction of conditions at high altitudes, and in aerodynamic problems such as spinning, where the conditions of flight are almost impossible to reproduce in a wind tunnel, but for the great majority of the latter the wind tunnel is the simplest, quickest and cheapest weapon of attack. Were it not for one unpleasant factor, it would probably do away very largely with the necessity for full scale work, which is expensive, very slow, and difficult to carry out. That factor is Scale Effect. If a scale model of an aeroplane is mounted upon balances in a wind tunnel, a stream of air of known velocity may be directed upon it, and the forces on the model may be measured very easily. The corresponding forces on the full-sized aircraft should then be directly obtainable by correcting for the scale of the model according to the laws of Dynamical Similarity. Unfortunately this is not so. The effect of scale or size comes in, and spoils the result. Now if this correction for Scale Effect were constant or varied according to any definite law, even then a few flight experiments to establish the law would constitute all the full-scale work necessary. The corrections so found would be applied direct to any results given by the wind tunnel. But Scale Effect varies almost without rhyme or reason. It varies for different wing sections, for different shapes of bodies, and alters under different conditions of speed. Even in the determination of such simple quantities as lift and drag co-efficients, its effect may be large, and when it comes to measuring more complex factors such as stability derivatives, the errors in model work may be so great as to render it valueless. So it is that direct full-scale experiment is the only really reliable criterion. It will be seen, however, that it is of the utmost

importance to obtain as much data as possible on the Scale Effect question. For this reason many aerodynamic problems are investigated simultaneously in the wind tunnel and in the air, and the results by the two methods compared.

This policy has an influence on the way in which the flying is carried out, in that the conditions on the flight tests are adapted as far as can be arranged to correspond with those obtaining in the model experiments, which are as nearly ideal as possible. The difficulties of doing this are very great. The essential factor required for accurate scientific measurement is steadiness of conditions, whereas the atmosphere is always more or less disturbed. Again, in a wind tunnel a wing may be tested as a wing alone, without any extraneous sources of disturbance except a few supporting wires. In full-scale work a wing must be provided with a fuselage and airscrew, an undercarriage, and all the rest of the paraphernalia of the complete aircraft.

Much thought has been expended on the elimination of errors due to these sources. Flying is carried out under the most calm conditions obtainable, and in summer most of the work is done just after dawn, before the sun has had time to work any mischief on the atmosphere. For some experiments, notably those concerned with the measurement of lift and drag, and also in spinning, the airscrew is locked in a fixed position after switching off the engine. The locking is done by means of a band brake controlled by the pilot, and can be released instantaneously. In the case of the lift and drag experiments this precaution avoids errors due to slipsteam, and in the case of the spinning, the gyroscopic couple due to the rotation of the airscrew. Again, in some experiments it is found necessary to provide locking devices for the control surfaces. A pilot may be asked to hold, say the rudder, fixed, during the performance of some manœuvres, and although he may try very hard to keep it so, time and again records of the movements of the control have shown that it has moved, though perhaps only very slightly, still sufficiently to invalidate the results.

It may be as well at this stage to give a brief description of one or two of the instruments used for full-scale aerodynamic research, apart from those fitted as standard equipment on most aeroplanes.

It is well known that the ordinary pitot head does not give a reading of the true air-speed of an aeroplane. There is a correction for density which is easily dealt with if the height and temperature are known, and there is also a correction for the interference effect of the rest of the aircraft on the pitot head. This is known as the Position Error correction, and is not easily determined, because it obeys no law, and, as its name suggests, varies with the position of the pitot head, and is different for every aeroplane. To measure true air-speed direct the suspended Air Log was designed. This instrument consists of a small

windmill mounted at the head of a shaft provided with stabilizing fins at the tail, so that when suspended the shaft lies parallel to the path of the aeroplane. The windmill drives a make-and-break through reduction gearing. This closes and opens an electrical circuit carried through the wire, by which the instrument is suspended below the aircraft at a distance of about fifty feet, where it is quite clear of any disturbance from the aeroplane. The circuit is completed through a Veeder counter, from which can be read direct the air distance travelled. By using a stop watch in conjunction with this instrument the true air-speed can be calculated.

The attitude of the aircraft fore and aft can be obtained by means of an ordinary bubble inclinometer mounted on the side of the cockpit. A more elaborate instrument consists of a pendulum carrying a small mirror at the end, on which is focussed a ray of light from an electric lamp. The whole apparatus is enclosed in a light-tight case, and the ray of light is reflected on to a cinematograph film driven slowly by an electric motor. In this way a continuous record of the longitudinal trim of the aeroplane relative to the horizontal can be obtained in normal straight flight.

Another interesting continuous record instrument is the control movement recorder, or " rat " (so named from its characteristic shape). The " rat " is mounted on the wing or fuselage adjacent to the control surface the movements of which it is to measure. From the tail of the " rat " there projects a system of jointed links which are attached to the control surface in such a way that any movements of the latter are communicated to a small rotating mirror inside the instrument, which again reflects a ray of light on to a moving photographic film. Needless to say, the records of these tell-tale instruments are occasionally regarded with considerable animosity by the luckless pilot. The " number of pints drawn " over a not-too-skilful landing are shown up impressively by records taken on the elevators.

A very important instrument is the three-axis rate of turn recorder. This consists of three small gyroscopes mounted so that their axes, which are all perpendicular to one another, lie, one along the axis of roll of the aeroplane, another along the axis of pitch, and the third along the axis of yaw. The gyroscopes are electrically driven, and their precession is controlled by light springs. A small mirror is arranged, one for each gyroscope, so that any precession causes the mirror to be tilted, this tilt being recorded by a ray of light reflected by the mirror on to a travelling film. So long as the aeroplane travels in a straight line the three mirrors remain still, but as soon as any departure from this occurs, the gyroscopes expostulate in the well-known way, and each gives a record of the angular velocity or rate of turn about its own particular axis. It was with this instrument that the

characteristic features of the spin were so well demonstrated. In a normal spin the rates of roll and yaw were shown to be nearly equal, and the pitch very small in comparison, whereas as the spin became flat, the yaw became larger and larger.

Mention should be made of the Recording Accelerometer. This, as its name suggests, measures the acceleration obtained in manœuvres in multiples of " g," the acceleration due to gravity.

Lastly, a " maid-of-all-work " has been devised to relieve the pilot of a single-seater aircraft of the responsibility of taking any instrument readings, and to leave him entirely free for the flying of the aeroplane. This is known as an Automatic Observer, and consists of a cinema camera which will photograph several instruments simultaneously at even intervals of time.

There are, of course, many other instruments which have been designed from time to time to meet with special requirements, and it would be impossible to describe them all, just as it would be impossible to describe all the experiments a research pilot or observer might be called upon to carry out. Four of the more important experiments will be described.

The first, which is perhaps the most straightforward, is the measurement of the lift and drag of an aeroplane, and is carried out normally with a crew of two. The aircraft, equipped with an Air Log and Inclinometer, is climbed to a height of some 10,000 feet, where the observer lets out the log. The pilot switches off the engine, and locks the airscrew. He then starts a straight glide at a prearranged speed. When he is quite settled on his speed, he signals to the observer, who immediately starts taking stop-watch readings of height, speed and altitude of the aircraft longitudinally at even intervals of time. The glide is continued for some three minutes, at the end of which the observer completes his readings and signals to the pilot. The airscrew is released, the aeroplane dived until the engine starts, and the experiment is repeated at another speed over roughly the same height range. There are several essentials to the success of this experiment. One is that the air should be quite calm, with no vertical currents, and another that the pilot should not allow his gliding speed to vary more than a mile an hour either way. Keeping a speed to such a degree of accuracy requires considerable practice, especially when the aeroplane is flying at or above the stalling angle. The point of maximum lift is the most important on the lift curve, and it is at the stall, therefore, that the greatest call for accuracy is made.

This accuracy in flying on a given speed is a feature of most research and test flying, and its importance cannot be over-emphasized. From the readings obtained, a point on the lift and drag curves for the aeroplane is established from each glide. Three glides on an aircraft such

as the Bristol Fighter, on which so much work on different wing sections has been done, will take at least an hour to carry out with intervening climbs, and it is rarely that more than this number is accomplished in one flight. Taking into account the fact that good results can only be obtained in perfectly calm weather, and making some allowance for possible unserviceability of the aircraft or instruments for short periods, it will be seen that the determination of the complete curves is a long piece of work.

One of the most important aerodynamic problems which has engaged the attention of the Aeronautic Research Committee recently is that of control and stability at and near the stall. The behaviour in the stalled region of several different aeroplanes has been completely investigated in the air. One of the most notable of these is the three-engined Fokker F. VII which, it will be remembered, was demonstrated by its designer at Croydon in 1925. He made the claim that it was completely under control when stalled, a feature not then possessed by any other aeroplane except the Royal Aircraft Establishment Avro fitted with interconnected slot and aileron control. For an investigation of the control and stability the aeroplane is equipped with the three-axis gyroscopic recorder to give a continuous record of the rates of turn in roll, pitch and yaw about the centre of gravity. Control movement recorders are fitted to all the control surfaces, and instruments to give records of incidence angle and sideslip will probably be fitted as well. All these will be synchronized by an electrically driven timing clock.

The aeroplane is climbed to a height of some 7,000 feet, and the observer will set the whole recording system in motion. The pilot will throttle back the engine and switch off, gradually stalling the aircraft. When he has obtained a steady stalled glide, the reaction of the aircraft to application of the controls can be investigated. In order to simplify the work, and separate out all the factors, it is customary to use only one control at a time. Thus in investigating the aileron characteristics, the rudder bar is held fixed central with the feet whilst full aileron is given in one direction, and held there for a definite time interval until the whole of the initial movements of the aircraft from the steady stalled state have taken place. As has been mentioned already, this work puts some strain on the flying instinct of a pilot, and the temptation to correct with the other control is considerable. In the experiments on the Fokker, where side by side dual control is fitted, it was found a help to have a second assistant pilot. His duty, on the initial signal, was to take charge of the control not being used —in the above case, the rudder—and to concentrate on holding it fixed against any unintentional movement on the part of the actual pilot, releasing it at the end of the manœuvre.

An interesting feature shown up by this experiment is the effect of aileron drag on an unslotted conventional aeroplane when stalled. When the aileron is put hard over the aircraft starts to answer it slowly, then quite suddenly the drag will predominate, and the aeroplane starts to roll and yaw in the opposite direction, probably finishing in the characteristic incipient spin.

From the results obtained from the instruments the complete motions of the aircraft due to a known movement of controls can be plotted in graphical form. This work is of inestimable value in comparing the characteristics of different aircraft and different types of control.

Yet another problem which is becoming of increasing importance in flying is the question of prolonged spins. It is well known that certain types have developed stable forms of spins from which recovery has been impossible. A classical example is that of the B.A.T. Bantam, and there have been a number since then which have been very difficult, if not impossible, to effect recovery on after the spin has been allowed to proceed for eight or ten turns. Much research work has been carried out, and the influence of certain factors established, such as the beneficial effects of positive stagger and wide gap, and the ill effects of the centre of gravity being too far aft in relation to the centre of pressure; also the shielding of the tail unit by a short stumpy fuselage. The mechanics of the spin are extremely complicated, however, and very much more work will have to be done before the problem is understood completely. Full-scale work is heavily handicapped by the great difficulty of obtaining reliable readings from a number of instruments whilst spinning, a purely human shortcoming, and the comparatively little time available in which to take them. In view of these difficulties every effort has been made to relieve the crew of the aeroplane, of the responsibility of taking any but the simplest observations, the rest of the readings being made by an Automatic Observer, under the manual control of the passenger.

The full equipment of the aircraft includes an accelerometer arranged to give the acceleration perpendicular to the wings, the three-axis gyroscopic rate of turn recorder, and control movement recorder. The Automatic Observer takes photographic readings of a stop watch, an altimeter, longitudinal and lateral bubble inclinometers. These instruments are all synchronized by an electrical timing clock. It may be noted, in passing, that when all this is stowed in the back cockpit of a Bristol Fighter, the most serious problem still remains to be solved—that of finding room for the rear half of the crew and his parachute. Also the centre of gravity is far enough aft to give a very healthy spin.

The aeroplane is climbed to some 10,000 feet. The engine is switched off and the airscrew locked. The recording instruments are

started, and the ailerons may also be locked. The aeroplane is then stalled and spun. It is considered that until two turns from the start have been completed, conditions are not steady enough for any reliable measurements. Both the pilot and observer carry stop watches and count the turns of the spin against some prominent object on the ground, or, if the sky is clear, by the passage of the sun across the bottom wing. When two turns have been completed, the stop watches are started, and the observer presses a tapping key which makes a break in all the photographic records. Six turns are timed in the spin, at the end of which the key is pressed again. The pilot then unlocks the ailerons, reverses controls, and makes careful note of the number of turns necessary for recovery, and also the type of recovery. The engine is restarted in the subsequent dive. The number of turns has been increased to some fifteen or sixteen, but it is found that even then the conditions are not steady, and that the spin is becoming more and more flat. Thus the ceiling of the aeroplane becomes the limiting factor in the investigation. Apart from the mathematical data obtained from these experiments, many points have been observed on the general nature of spins. The type of entry has a great influence on the subsequent characteristics. The aeroplane may be stalled violently or gently, and the spin entered from straight flight or whilst on a spiral turn. Every different combination of control movements in the entry stage may have some effect on the nature of the spin, and probably no two pilots will do it in exactly the same way.

The object of stopping the airscrew during the spin is purely that of simplification. It is well known that a gyroscopic couple arises, due to the rotation of the airscrew and the spinning of the aeroplane, and this tends to raise or depress the nose according as the direction of spin is in the opposite or the same sense as the airscrew rotation. Thus rotation of the airscrew at once creates dissimilarity of the spins to left and right, which is undesirable from the experimental point of view. This feature has, however, been useful in certain extreme cases of flat spin to the left where opening the throttle (the engine rotating in an anti-clockwise direction as viewed from the pilot's cockpit) has just provided the necessary couple to depress the nose of the aircraft and enable recovery to be made. In the early days when rotary engines were in vogue, considerable care had to be taken over steep turns, since this gyroscopic couple produced a force tending to pull the nose of the aeroplane down when turned in one direction. This was responsible for many fatal spins off right-hand turns near the ground, on the famous Camel, since an inexperienced pilot would attempt to correct this by pulling back the stick instead of applying left rudder.

The locking of the ailerons in the neutral position effects another simplification of the spinning characteristic. The effect of normal

ailerons without any form of slot device is purely secondary in spinning, though assistance is given to the manœuvre by holding them against the direction of spin. The yawing component then helping the spin is very much greater than the rolling component hindering it. With slots fitted the yawing moment is reversed in direction, and the stick would have to be held over towards the direction of spin to assist it.

The last of the four chosen experiments can be described very briefly. It has for its object the measurement of the loads which may be expected on an aeroplane subjected to sudden manœuvres, and consists of carrying out certain aerobatics such as flick rolls, and pulling out from steep dives as violently as possible. Here again the forces are obtained photographically. An acceleration of seven times gravity has been produced on an aeroplane in pulling out from the dive during experiments in this country, and it is understood that in America Lieutenant Doolittle achieved 11 " g " on a specially strongly designed aircraft. The physiological effects of such high accelerations are of great interest. To anyone unaccustomed to aerobatic flying 2 g would be unpleasant, but with practice much higher values can be experienced without discomfort, though the average pilot probably blacks out, and loses visual powers at about 5 g. The time factor enters into the question, an acceleration of the order of 2 or 3 g prolonged for say a quarter of a minute being worse than a much higher value applied for a very short fraction of time. The type of manœuvre also has some effect from this point of view, though it is only in the direction perpendicular to the wings, that is roughly in the line of the head and the feet of the pilot, that high accelerations can be induced. It has been suggested that from the point of view of racing, where sharp cornering is required, the prone position would be the best for the pilot to adopt, though obviously from this point of view only. In this position the blood would be forced, not directly from the head to the feet as in the normal case, but merely from one side of the head to the other.

Much might be written upon the subject of the personnel required for full-scale research. The ideal individual would be a scientist who was also a first-class pilot, or vice versa. Such men are unfortunately rare, for the simple reason that very few have the opportunity or the aptitude necessary for acquiring both these qualifications.

The best combination, failing this ideal, is undoubtedly that of the highly trained pilot carrying the scientist as observer. There are, however, many experiments on single-seater aircraft where an observer cannot be carried, and the pilot is left to do the whole of the work. One of the most important faculties for him to cultivate, and one essential under these conditions, is the power of observation. This is

only second in importance to the necessity for accuracy in flying, be it keeping a steady speed, maintaining constant height, or whatever the requirement of the experiment may be.

For the scientist or engineer coming possibly fresh to flying there is everything to learn. An aeroplane is probably the worst laboratory that could possibly be found, quite apart from the fact that air sense has to be gained. He may consider himself lucky if he has had some experience of flying before he has to start on serious work. There is no doubt that if he can get even only slight training as a pilot, it is of great help to him. It enables him to appreciate the pilot's point of view, and to understand his difficulties.

Full-scale Aerodynamic Research combines one of the most interesting branches of flying with one of the most fascinating lines of development of modern scientific work. Some might question its practical utility. A glance at the progress made in the directions of the safety and performance of aeroplanes during the last few years should be sufficient for them.

ENGINE RESEARCH

By Andrew Swan, B.Sc., A.M.I.C.E.

The importance of research is perhaps accentuated in regard to aircraft engines, where the requirements to be met are exacting and improvements increasingly difficult of attainment. Engines must of necessity give a high performance for minimum bulk and weight, be efficient and economical, and, above all, reliable, and it is with these factors clearly in view that engine research is planned.

The field of engine research is relatively wide, embracing as it does the study of combustion phenomena, the merits and efficient use of fuels, the economic employment of various materials ranging from high-quality alloy steels to light but strong aluminium and magnesium alloys, carburation, engine cooling, lubrication and the many subsidiary details necessary to the proper functioning of the engine. A factor to be borne in mind also in the research is that the atmospheric conditions under which the engine operates are continually changing with altitude, and have to be suitably allowed for so that the running of the engine will not be impaired.

Important research on which experiments are proceeding are supercharging, that is the retention, by artificially raising the weight of the mixture charge, of ground level power at various altitudes, and the further extension of this work to ground boosting, in which the engine cylinders are given a charge of mixture at a pressure above that of the atmosphere; also evaporative cooling of engines, fuel economy, and experimental works on newer types including the compression ignition engine.

In these articles it is proposed to deal with the more important research and also to mention smaller items where these have an appreciable effect on the performance or working of the engine. As the supercharged engine is a comparative newcomer to the Service, it will be convenient to commence with this type and to describe the further research being made towards improving and extending the scope of its use.

Supercharged Engine Research.

To improve aircraft performance it is desirable to prevent the engine power falling off with increasing altitude, as it normally would do owing to the reduction in pressure and density of the surrounding atmosphere, and several methods are employed to this end. Amongst these may be mentioned the high compression ratio engine, which is either throttled at lower altitudes to prevent detonation and only opened

up fully at the suitable altitude, or used with a bi-fuel system, a non-detonating fuel for the lower altitude and the normal fuel supplied only at a pre-determined height where the cylinder pressure and temperature are insufficient to promote detonation. The most common method, however, is by pre-compressing the charge by a blower or compressor to the desired amount before admission to the cylinders, and in this way the induction pressure and hence the ground-level power can be kept approximately constant up to the height for which the compressor has been designed to compress the necessary quantity of air.

The compressors most suitable for aircraft, by reason of their weight and dimensions, are the centrifugal and positive displacement types.

Centrifugal Compressors.

Supercharged engines in Service are fitted with a centrifugal type of compressor, the impeller being driven at a high speed through gearing from the engine. Speeds of 20,000 r.p.m. are usual. The mixture enters the eye of the impeller, and in passing to the tips of the blades is compressed and delivered through diffuser vanes to the induction system of the engine. The carburettor is as a rule on the suction side of the compressor, although a pressure system in which the carburettor is placed on the delivery side of the blower can be used. The former method or " suction system " is simpler in installation and has an advantage in that as the mixture passes through the compressor the petrol is finely divided and intimately mixed with the air, with beneficial results on distribution. Two views of a gear-driven centrifugal supercharger with a shrouded impeller are shown on Fig. 1. The weight of compressor and gears for a 450 h.p. engine supercharged to 12,000 ft. is approximately 45 lb. additional to the engine.

In flight the method of control of the induction pressure is by means of the throttle, using a boost gauge to indicate this pressure. To keep a constant induction pressure with increasing altitude, therefore, the throttle is progressively opened until full throttle height is reached, after which height the power falls off as for a naturally aspirated engine.

Exhaust-Driven Compressor.

Much experimental work has been done on the exhaust-driven centrifugal compressor in which the compressor impeller is mounted on the same shaft as a turbine wheel, the whole being a separate unit from the engine. The energy in the engine exhaust is utilized to drive the turbine, and the gases are directed on to the turbine wheel through nozzles. With altitude the pressure of the atmosphere decreases; the pressure drop of the exhaust gases across the turbine nozzles increases, due to the maintenance of constant engine conditions, and the speed of revolution of the turbo-compressor is increased. This is, in effect, a

varying gear, and the higher speed of the compressor gives a greater pressure rise to the air and so increases the full throttle height of the aircraft.

Against the gain of power from the utilization of otherwise wasted exhaust gases in this method, it must be mentioned that a back pressure, usually about 4 lb. per square inch above the induction pressure, is imposed on the engine, resulting in some reduction of power. In water-cooled engines this reduction is approximately 1.6 per cent. for each lb. of back pressure above normal. A further loss of power with this system appears to be experienced due to the increased temperature of the engine as a whole. For supercharging to high altitudes an intercooler between the compressor and the engine cylinders is fitted, as, at the higher compressions of the blower, the temperature of the air is raised considerably, and if allowed to enter the cylinders at this temperature would reduce the weight of the charge and power. Fig. 2 is a photograph showing a complete turbo-compressor unit installed on a Liberty engine.

Displacement Blowers.

Amongst positive displacement compressors or blowers perhaps the best known is the Roots type, which, in principle, is analogous to a two-toothed gear pump consisting of two figure-of-eight rotors or impellers of cycloidal form, geared together to maintain proper relationship. Fig. 3 shows two views of this type of blower. The rotors are gear-driven from the engine and rotate at approximately 4,000 r.p.m., and the weight of a blower to supercharge a 450 h.p. engine to 20,000 ft. would be 100 lb. without extra piping. The over-all dimension would be 16 in. by 20 in. by 14 in. No compression is done in the blower itself, but the rotors have to deliver against the pressure existing in the induction pipe of the engine. Another form of positive displacement blower is the rotating-vane type of which the Powerplus, shown on Fig. 4, is an example designed for aircraft. An ingenious mechanism is employed in this blower to eliminate the angular acceleration and retardation of the vanes during rotation, a feature of most vane blowers, and in consequence the fluctuations in transmission loads are reduced. This should give improved reliability, particularly at high speeds.

Performance and Merits of Various Supercharging Systems.

As regards the relative merits and uses of the various compressors it is necessary to consider not only the question of efficiency of performance and power required to drive the blowers, but to consider the respective weights and installation qualities and to determine from these the particular applications for which each is best suited.

In centrifugal compressors the pressure rise is mainly a function of the tip speed, and with high rotational speeds it can be made, even with its gears, a relatively light unit suitable for embodiment in an engine, particularly a radial engine, with little increase in dimensions. The efficiency of compression of a centrifugal compressor is of the order of 65 per cent., while that of some displacement blowers is higher. By virtue of rotation and consequent compression within the centrifugal compressor, the power required for compression is always expended, even at ground level, when no supercharge is required. This is not so for the displacement blower where, at ground level, a by-pass valve can be opened to enable atmospheric air to be sucked into the cylinders without passing through the blower. (A pressure carburettor system is employed so that by-passing affects air only and no fuel is lost.) The power expended on the blower under this condition is only that to rotate it without compression, and is small. As height is gained the by-pass valve is gradually shut and the compressor brought into action.

An estimation of the airscrew-shaft horse power of a supercharged engine fitted with various types of supercharger may be made by considering the following factors, and the results are of interest in showing the possibilities of the several systems.

These factors are:—

1. A correction for reduction of engine speed at altitudes below the rated altitude due to the use of a fixed airscrew, and a possible correction due to change in torque at the reduced speed.
2. Correction for change in volumetric efficiency due to temperature of charge.
3. Correction for difference between pressure in induction and exhaust pipes.
4. Correction for power required to drive the gear-driven supercharger. (The correction in the case of the exhaust-driven supercharger is included under 3.)

To make the comparison more direct, an unsupercharged engine giving 100 h.p. at normal r.p.m. on the ground will be used as a basic power, and the power will be estimated of this engine at several altitudes when fitted with the various superchargers. For a comparison between engines fitted with the gear-driven centrifugal and gear-driven displacement-superchargers respectively, a supercharged height of 12,000 ft. will be used, and as between the gear-driven displacement and exhaust-driven supercharger a supercharged height of 25,000 ft.

The reduction in engine speed on the ground is of the order of 350 r.p.m. for a 12,000 ft. supercharged engine, and 450 r.p.m. for a 25,000 ft. supercharged engine.

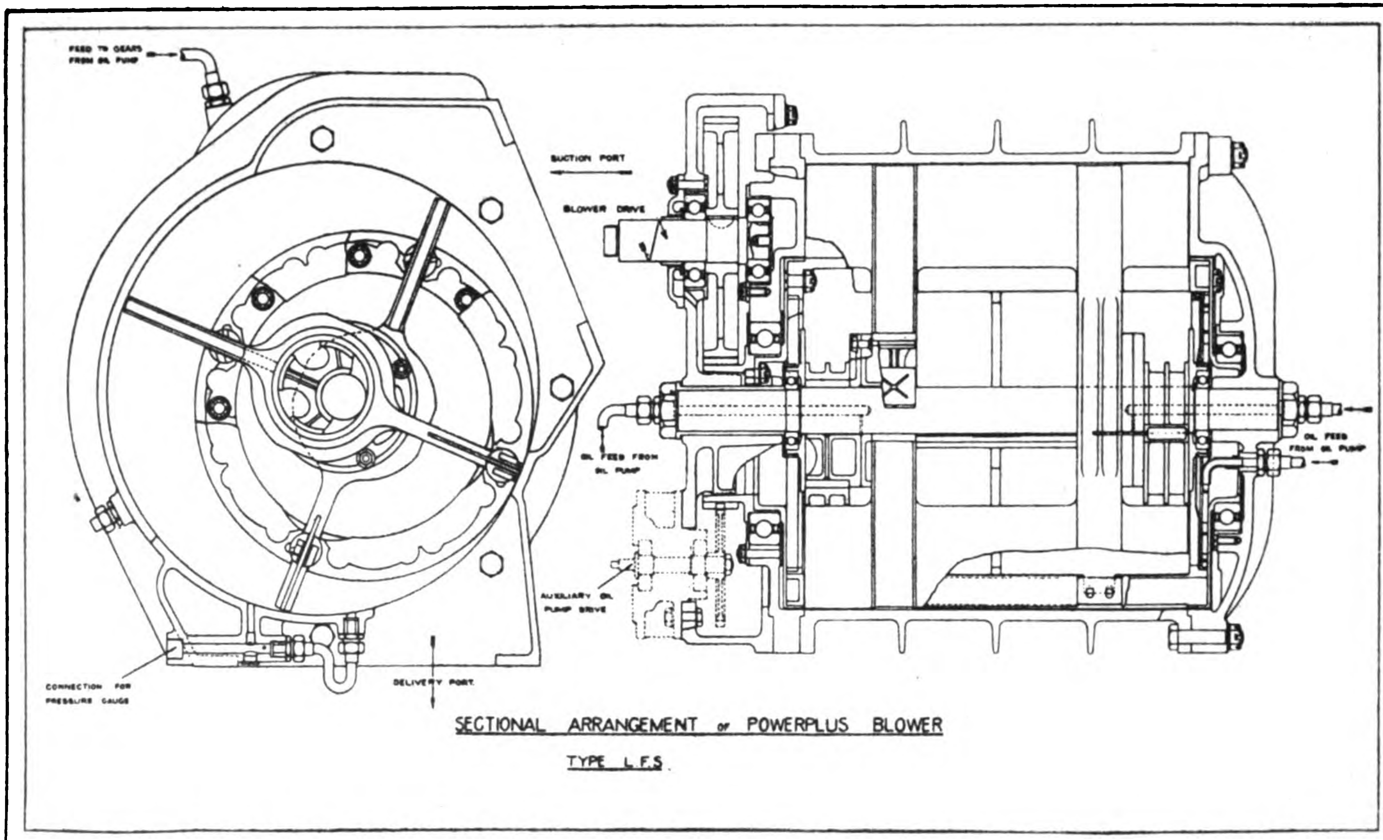

FEED TO GEARS FROM OIL PUMP
SUCTION PORT
BLOWER DRIVE
OIL FEED FROM OIL PUMP
OIL FEED FROM OIL PUMP
AUXILIARY OIL PUMP DRIVE
CONNECTION FOR PRESSURE GAUGE
DELIVERY PORT
SECTIONAL ARRANGEMENT OF POWERPLUS BLOWER
TYPE L.F.S.

Fig. 4.

The approximate estimate is as follows :—

Engine.	Power.		
	Ground Level.	*12,000 ft.*	*25,000 ft.*
Normal Engine	100	62	—
Engine with 12,000 ft. gear-driven centrifugal-supercharger, with suction carburettor	76	96	—
Engine with 12,000 ft. gear-driven displacement-supercharger with pressure carburettor	89	96	—
Engine with 25,000 ft. gear-driven displacement-supercharger with pressure carburettor	80	—	87
Engine with 25,000 ft. exhaust-driven centrifugal-supercharger with suction carburettor	71	—	82

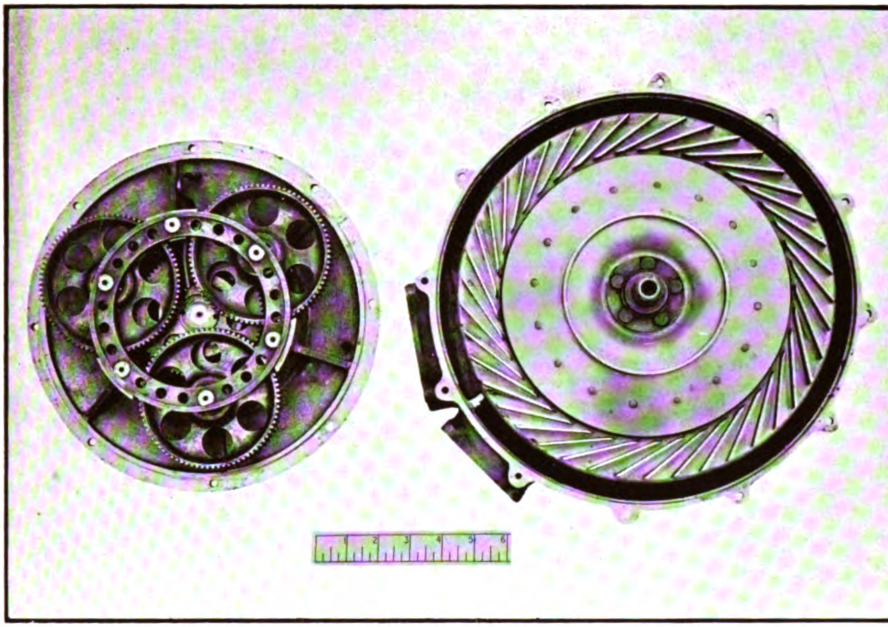
A variable pitch airscrew, due to the higher engine revolutions obtained thereby, would reduce the losses sustained on the ground, and the actual loss then for the displacement blower would only be the power required to drive it with by-pass valve fully open.

The respective performances of a D.H.9.A. aircraft fitted with an unsupercharged, and later with an exhaust-driven supercharged engine at the same aircraft weight, are :—

	G.L.	*5,000 ft.*	*15,000 ft.*	*25,000 ft.*	*30,000 ft.*
Rate of Climb—ft./min. :—					
Unsupercharged	920	—	305	—	—
Supercharged	835	—	835	625	200
Level Speeds—m.p.h. :—					
Unsupercharged	—	129	114	—	—
Supercharged	—	129	141	145	130
Ceilings :—					
Unsupercharged					19,500 ft.
Supercharged					31,600 ft.

These figures are more unfavourable to the unsupercharged engine than would actually be the case if the extra weight of the supercharger installation were added to the unsupercharged engine in the form of a larger engine giving more power. The comparison would then be between supercharged and unsupercharged engines of equal weight.

With light weight and good installation qualities in its favour, the centrifugal compressor is attractive, particularly for medium supercharged heights, but for high supercharged heights the power loss on the ground becomes large unless some form of reasonably light variable, driving gear could be used to reduce the speed on the ground and so minimize this loss. The displacement blower is attractive on performance at all the supercharged heights considered, although probably not so light and compact in installation as the other. For high supercharged altitudes this type has definite possibilities, particularly in view of its reduced ground losses. The efficient working of an exhaust-driven supercharger is attended by several difficulties, chief of which are the provision of special quality steel turbine rotors to withstand stress at the high temperature of the exhaust gases and the maintenance in reliable operation of a unit subjected to a great heat. The installation also tends to become cumbersome.



Photo] [*R.A.F. Official Crown Copyright Reserved*

Fig. 1. Two views of a gear-driven centrifugal-supercharger with a shrouded impeller.

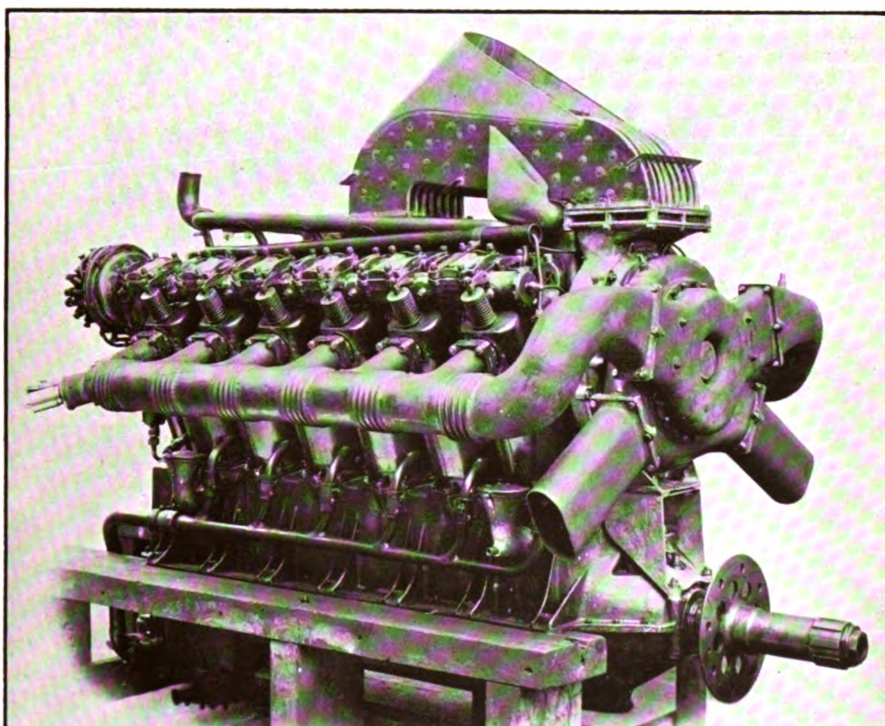


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Fig. 2. A complete turbo-compressor unit installed on a Liberty Engine.

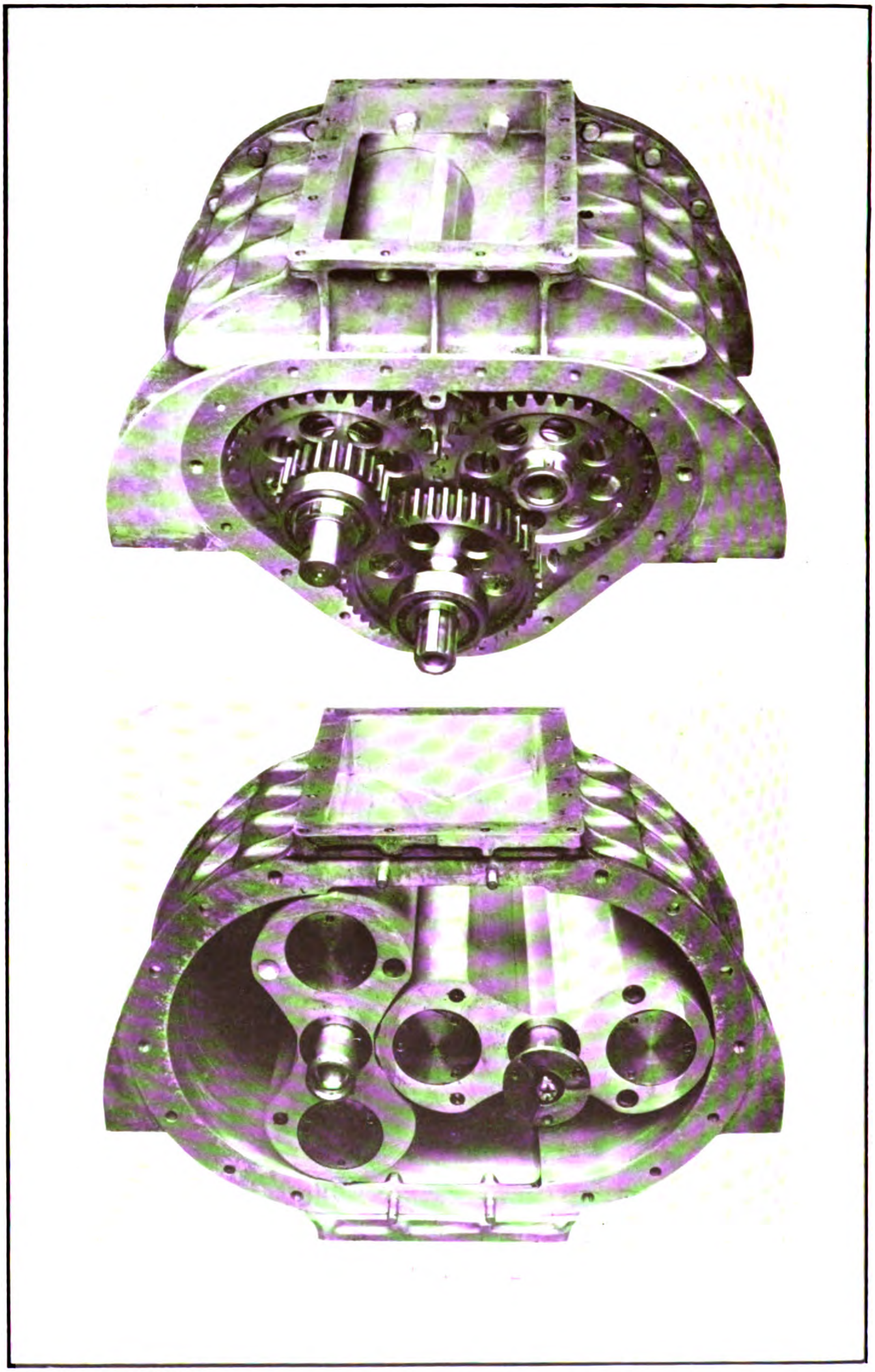

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Fig. 3. Two views of a Roots blower.

Increased Power by Supercharging.

By raising the supercharge of the induction air above atmospheric pressure at ground level it is possible to secure a boosted power. By this means a greater power per unit of cylinder volume is obtained, and even making allowance for the increased size of certain parts to withstand the higher stresses the weight power ratio of a boosted engine would be less than that of a naturally aspirated engine, whilst equal compactness of design would be retained.

Because of the higher pressure and temperature of the mixture charge under boosted conditions, the compression ratio of the engine has to be reduced as the boost is increased, when using the same fuel. This is necessary to prevent detonation, unless a fuel of greater anti-detonating qualities is used. The gain in power under boosted conditions, in spite of the reduced compression ratio, is due to several factors, amongst which is the greater weight of charge given to the engine, a higher volumetric efficiency because of the reduced volume of residual exhaust gases when compressed by an initial charge at a higher pressure, an improved distribution between the cylinders when the mixture is supplied by a blower, and a higher mechanical efficiency.

The specific fuel consumption is greater in the boosted engine than in the naturally aspirated one, mainly on account of the power expended in the blower and the lower thermal efficiency at reduced compression ratios. The weight of the extra fuel it is necessary to carry for such an engine therefore tends to counterbalance the reduced weight of the engine, but if the weight of the power plant, *i.e.*, engine and fuel, be considered together, the boosted engine would have an application and advantage for flights of short duration.

Engine Coolants and Evaporative Cooling.

The good stream-line installation qualities of the water-cooled engine are marred to some extent by the drag imposed by the cooling system. Many improvements in radiator tube and block design have been made to reduce this drag, while retractable radiators or radiators fitted with shutters are also employed for the same purpose. The surface exposed in these latter depends on the conditions of flight, the greatest exposure being on climb.

Wing cooling has also been used. In this system the water is circulated through long tubes fitted on the surface of the wing and running at right angles to the span or alternatively through a surface radiator on the wing, the radiator being formed by a double skin between which the water passes. Drag is reduced by the adoption of wing cooling in place of the usual radiator, but the construction necessitated is not simple, and from the Service standpoint the vulnerability is increased by the greater surface exposed.

LIQUID COOLANTS OTHER THAN WATER.

If a liquid with a higher boiling point than water, and in other ways suitable, could be used as a coolant at jacket temperatures in excess of 100° C. the radiator size would be reduced accordingly. For example, if a cylinder jacket temperature of 150° C. be considered, the temperature difference between the engine coolant and the cooling air through the radiator would be much higher than normally experienced, resulting in more cooling per unit of radiator surface, and it is estimated that the surface required would only be half that necessary for water cooling. Amongst several liquids which have been considered for this purpose are Ethylene Glycol and Glycerine, of which some particulars are given below.

	Density at 25° C. (approx.)	*Viscosity at 25° C. (approx.)*	*Specific Heat (approx.)*	*Boiling Point.*	*Flash Point.*
Water	1·0	1·0	1·0	100° C.	—
Ethylene Glycol	1·11	17·0	·62	197° C.	124° C.
Glycerine	1·26	600	·59	290° C.	—
97 per cent. Glycerine ...	1·25	400	·59	—	178° C.

Ethylene Glycol would be a suitable substance for use as a coolant at 150° C. The flash point is lower than this temperature, and fire risk on crash might be increased. Its ignitable characteristics in contact with a hot piece of metal are probably of more importance, however, and, for ignition to occur thus, the temperature of the metal requires to be about 480° C. It has no deleterious effects on materials likely to be in contact with it, except for a slow deterioration of rubber.

Glycerine is very viscous at low temperatures, but pump tests have shown that circulation can commence at −6° C. if there is a small water content, this having the effect of reducing the viscosity. Up to temperatures of 150° C. the required quantity of water could possibly be retained in practice. Glycerine has a sufficiently high flash point, and with a small water content could be used as a coolant. Its action on materials is akin to that of Ethylene Glycol.

The rates of circulation by pump of Ethylene Glycol, Glycerine, and water, are approximately the same at 70° C., and for the former two liquids, the circulation remains fairly constant up to 150° C. The circulation of water, however, falls off with higher temperatures, at first slowly and then more rapidly, and ceases at 100° C.

As regards the effect on the engine, the few experiments which have been done show that at a jacket temperature of 150° C. there is a small reduction in volumetric efficiency and hence power, due to the higher temperature of the mixture charge in the cylinder. Probably the drop in power would be more than fully compensated for by the reduced drag of the smaller radiator required and, as a result, a better aircraft performance obtained.

It is unlikely that an engine developed to run water-cooled—*i.e.*, under 100° C., would, without development, be sufficiently reliable at a

jacket temperature of 150° C., and the application of this form of cooling will of necessity be associated with further experimental work, particularly as regards cylinder head construction and the effects of detonation and compression ratio.

It may be mentioned here that mixtures of Ethylene Glycol and water, respectively 30 and 70 per cent. by volume, and of Glycerine and water 36 and 64 per cent. by volume, are being used in cooling systems to prevent freezing at temperatures as low as $-15°$ C.

Evaporative Cooling.

A form of cooling that has received attention recently is evaporative or steam cooling. As applied to aircraft with wind condensers one system is as follows: Steam is allowed to form in the engine jackets and passes to a separator, where the water portion is returned to the engine. The steam then flows to the wing condensers and the condensate collects in a small central water sump and is returned to the separator by an extra pump. The condensers are suitably vented to atmosphere to prevent positive or negative pressures arising in them, due to variation in the amount of steam generated at different throttle openings. The usual engine pump circulates the water through the jackets to the separator and back to the jackets, so as to free the steam formed and prevent steam pockets and possible overheating.

Some preliminary work on the engine may be necessary to establish equal flow through each cylinder jacket, but no major alteration should be required to the engine itself.

There is less water necessary in the system with evaporative cooling than with water cooling, and a saving in weight is made on this account. The weight due to a leading edge condenser should be no more than that required for the ordinary radiator which it replaces. If the condenser be designed and made as a component part of the wing, it should be lighter. In any case the parasitic drag is reduced, resulting in a better aircraft performance. The vulnerability is probably no greater than that of a normal water system, as, although a greater area is exposed, most of that area is occupied by steam, and the loss of steam in a given time through a punctured hole would be considerably less in weight than that of water.

The surface area required for condensing purposes is dependent on the type of condenser used and the distance the condenser extends backwards from the leading edge. This latter is important, as the cooling capacity per unit area decreases as the distance from the leading edge increases.

Evaporative cooling may be limited in application to aircraft of low and medium power loading per square foot, but many other factors, such as air speed and wing design, enter into the problem, and sufficient data are not available at present to define the limits clearly.

(*To be concluded.*)

THE TESTING OF AERO ENGINES

By W. Lind-Jackson, B.Sc., A.F.R.Ae.S.

The tests to which an engine may be submitted, if it is subsequently to be installed in an aircraft for which an airworthiness certificate is required, will normally fall in one or other of the following categories :—

(i) Type test for new design of engine.
(ii) Acceptance test for new engine of approved design.
(iii) Acceptance test for repair and rectification engines.

In all these tests certain conditions, which are laid down in the Air Navigation Directions, must be complied with. The engine must be run on a test bench which is suited to the type of engine to be tested, and provision must be made for the accurate determination of all measurements and readings required in the course of the test. The test plant as a whole must be such that it is possible to vary the brake torque without stopping the engine, and it must be possible to measure the b.h.p. of the engine by means of the torque reaction of either the engine or the brake. In certain circumstances provision for a thrust test must be made, a calibrated airscrew, absorbing approximately nine-tenths full power at the rated normal engine speed, being regarded as satisfactory for this purpose. For other tests the use of an airscrew is not permitted unless provision is made for varying the torque without stopping the engine and a centrally pivotted test bench is used in which the torque reaction can be accurately counter-balanced.

Adequate cooling of the engine must be arranged for, arrangements being such that water temperature, in the case of water-cooled engines, can be regulated and maintained at a temperature of not less than 70° C., while oil temperatures must lie between 50° C. and 70° C. during the test. Arrangements for the cooling of air-cooled engines must be such that there is an air-speed not exceeding 120 m.p.h. in the region of the cylinder heads. No artificial means of increasing the humidity of the air is permitted.

Normally, all tests must be carried out at nine-tenths of full power and at the rated normal r.p.m. except for the last five minutes of any test, when the engine must be opened up to full throttle, but still at normal r.p.m. During this time the power developed, after correction for barometer and temperature, must not be less than the rated normal for the engine. In this connection the following definitions may be noted :—

(i) Normal r.p.m. is the maximum crankshaft speed at which the engine may be run continuously, as defined by the maker. During tests this must be kept constant by slight adjustment of throttle or load, depending upon whether power or throttle setting, *i.e.*, " nine-tenths power," or " full throttle," is the controlling factor at the time.

(ii) Maximum permissible r.p.m. is the maximum safe speed at which the engine may be run for short periods (say, five minutes) as declared by the maker. This is normally ten per cent. in excess of normal r.p.m., and must not be less than this.

(iii) The rated full power is the maximum power at normal r.p.m. as declared by the maker.

With certain exceptions, *i.e.*, as in the case of supercharged engines, the air intake to the engine must be at atmospheric pressure during all power tests.

Fuel and oil consumptions may be measured on endurance tests either by the total quantity consumed during the test, or by means of an approved type of flowmeter. In the former case no allowance is made for the extra consumption during the last five minutes at full throttle, while with a flowmeter the mean of readings taken during the test is used. Check consumption figures are taken during final tests. During normal fuel consumption tests the altitude control must be fixed in the normal ground position. Fuel consumption is specified in pints per b.h.p. per hour on the actual power developed, no allowance for barometer or temperature being made. Oil consumption on type test is specified in pints per b.h.p. per hour, but in tests of production engines in pints per hour only. In order that the engine shall be in no danger of under-lubrication, a minimum as well as a maximum oil consumption must be ensured.

Thrust tests at the rate of six pounds per b.h.p. applied to the airscrew may be required during, or at the conclusion of, the endurance test. If the engine is intended to be used as a tractor only or a pusher only, the load must be applied accordingly, but where an engine is to be used in either capacity, a proportion of the load must be applied in each direction.

At the conclusion of endurance and final tests, with the engine still warm, slow-running tests are made to ascertain that the engine will run reasonably slowly, and opens up to normal r.p.m. within five seconds without excessive " popping " or rough periods of running. The engine must run reasonably well at eighty per cent. reduction of speed from normal r.p.m. when the brake has been adjusted to ninety per cent. power at normal r.p.m.

In taking power curve tests the procedure laid down is as follows: The engine is first run at nine-tenths power at normal r.p.m. until a standard condition of running with normal oil and water temperatures

is attained. The throttle is then fully opened and locked in this position while the brake is adjusted to give maximum permissible r.p.m. After a reading is taken at this speed, the brake load is increased to reduce the speed by 100 r.p.m. and readings are taken similarly at each 100 r.p.m. to at least 400 r.p.m. below normal, and then up again by the same steps to maximum permissible r.p.m. Type test engines must be run at full throttle at each speed for at least five minutes, to obtain a steady reading of one half-minute's duration, while production engines must be run one minute at each speed, again to ensure a steady reading of one half-minute's duration. In each case the object is to avoid " snatch " readings.

During all tests, the engine must be run fitted with carburettors, magnetos and accessories which will be delivered with the engine, and the carburettor jet sizes must be those authorized for flight conditions.

Type Test for New Design of Engine.

An endurance test of 100 hours' duration at normal speed at ninety per cent. full power is taken, comprising ten non-stop runs of ten hours' duration. Fifty hours of this test are run with an airscrew fitted. The last ten hours must be run on an approved form of brake, and at the commencement of the one-hundredth hour of the endurance test the load must be increased so that the engine is running at full power at normal r.p.m., until within five minutes of the completion of the test, when the engine will be opened up to full throttle. Slow running and acceleration are tested, the period of slow running being ten minutes.

On completion of the endurance and slow-running tests, a high-speed test, in which the engine is run for one hour continuously at a speed of five per cent. in excess of maximum permissible speed, under load conditions at the option of the manufacturer, is carried out. This is followed by the high-power test, in which the engine is run at the maximum permissible speed at full throttle.

Power curves are taken both before and subsequent to the foregoing tests. On completion of the tests the engine is completely dismantled for examination, and, if found in satisfactory condition, rebuilt for a final test of thirty minutes' duration under the same conditions as the endurance test.

Where an engine is to be supplied to H.M. Government, certain limits for fuel and oil consumption are laid down. For water-cooled engines fuel consumption shall not exceed .54 pint per b.h.p. per hour, and oil shall not exceed .025 per b.h.p. per hour, while in the case of air-cooled engines fuel shall not exceed .60 pint per b.h.p. per hour, and oil .045 pint per b.h.p. per hour.

The water pump delivery in the case of a water-cooled engine, at

normal r.p.m. should be at least fifteen gallons per minute per 100 b.h.p. against a circuit resistance or head of two pounds per square inch in excess of the hydraulic resistance of the engine, while the water just before the pump inlet branch is maintained at 75° C. and its pressure is at least four pounds per square inch below atmospheric.

Acceptance Test for New Engines.

The conditions under which these tests are run are similar to those of the type test of new engines, the following procedure being adopted :—

Engines are run in light either on town gas or driven from some external source of power for a minimum of two hours. This is followed by tuning on petrol fuel for at least fifteen minutes before the start of the endurance test. Power, slow running and general satisfactoriness of the engine are checked. In the case of final tests the period of such tuning may be reduced to five minutes.

The endurance test consists of two hours at normal r.p.m. and ninety per cent. full power, except for the last five minutes, when the engine will be run at full throttle. During the tests fuel and oil consumptions are measured, and power curves, slow running and vibration tests taken. Ignition and altitude control are checked.

On the satisfactory completion of the test the engine is completely dismantled for inspection, any badly worn or defective part being renewed. Renewal of any major component involves a repetition of the endurance test for a period of one hour at least. If the condition of the engine is satisfactory, it is rebuilt and subjected to a final test of one half-hour duration. This test is again run at ninety per cent. full power and normal r.p.m., except for the last five minutes, when the engine is again opened up to full throttle. At the conclusion of the test, slow-running and acceleration tests are made, and ignition drop tested at normal r.p.m., full throttle. The drop of engine speed when either magneto is switched off should not exceed two per cent. Power and throttle curves are taken after the endurance test is completed.

The following report on the final half-hour test of a Napier " Lion " Series XIa engine may be taken as typical of such a test :—

(1) Twenty-Five Minutes at Nine-Tenths Load, Normal Speed.

Speed	2,350 r.p.m.
Observed b.h.p.	477 b.h.p.
Fuel consumption	Average ·534 pt./b.h.p./hour.
Lubricating oil consumption ...	8 pts. per hour.
Lubricating oil pressure ...	60 lbs./sq. in.
Lubricating oil temperature ...	Inlet, 59° C. ; outlet, 77° C.
Cooling water temperatures ...	Inlet, 70° C. ; outlet, 79° C.
Fuel pump flow	Total and excess 1,000/750 pts. per hour approx.

(2) Five Minutes at Full Throttle, Normal Speed.

Speed	2,350 r.p.m.
B.H.P. Corrected to standard atmospheric pressure and temperature (760 mm. and 15° C.) and exhaust back pressure ...	550 b.h.p.

(2) Five Minutes at Full Throttle, Normal Speed—*continued.*

B.M.E.P.	127 lbs./sq. in.
Fuel consumption	Average ·510 pt./b.h.p./hour.
Lubricating oil temperature and pressure...	As above.
Water cooling temperature ...	As above.

(3) Altitude Control Test.

Fuel consumption with cock closed	275 pts./hour.
Fuel consumption with cock opened	212 pts./hour.
	22·9% control.

(4) Ignition Test.

R.P.M. with both magnetos ...	2,350 r.p.m.
R.P.M. with inlet magnetos only firing	2,240 r.p.m. approx.
R.P.M. with exhaust magnetos only firing	2,250 r.p.m. approx.

(5) Throttling Power and Consumption Curves.

Brake set at maximum permissible speed (approx.) and full throttle (one minute at each speed) :—

R.P.M.	*B.H.P.*	*Fuel Consumption, pts. per b.h.p./hour.*
2,600	561	·517
2,500	515	·534
2,400	469	·540
2,300	412	·558
2,200	368	·565
2,100	325	·581
2,000	287	·593
1,900	255	·617
1,800	227	·630
1,700	197	·655
1,600	169	·683

(6) Power Curve.

At speeds from 15% above normal r.p.m. down to 10% below and up again (one minute at each speed). Power fully corrected as during five minutes at full throttle.

Mean Results.

R.P.M.	*Corrected B.H.P.*		*Corrected B.M.E.P. lbs. sq. in.*
	Down.	*Up.*	*Mean.*
2,700	598	599	124·4
2,585	581	583	122·0
2,450	564	565	125·0
2,350	549	548	126·5
2,250	531	530	128·0
2,100	500	—	129·1

(7) Slow Speed Test.

Engine to run reasonably well at 80% below normal speed.

470 r.p.m.

B.H.P. Correction.

Barometer.

$$\text{Corr. b.h.p.} = \frac{\text{obs. b.h.p.} \times 760.}{\Phi o}$$

Φ = Recorded barometric pressure in mm. mercury.

Air Intake Temperature.

$$\text{Corr. b.h.p.} = \text{Obs. b.h.p.} \times \sqrt{\frac{273+to}{273+15}}$$

to = Observed Temperature in °C.

Exhaust Back Pressure.

Corr. b.h.p. = Obs. b.h.p. × 1 + ('015 × Pe).

Pe = Positive Pressure in lbs./sq. in. in exhaust disposal system.

(Allowance at the rate of $1\frac{1}{2}$% per lb./sq. in.).

AN ARTICLE ON THE NEED FOR PROGRESS IN AIR ARMAMENT

"Learn or perish."—*Lord Grey of Fallodon.*

The great efforts, since the war of 1914-1918, to avoid another war of the same kind and to restore the damages caused to commerce, have tended naturally to turn the minds of those responsible for the employment of Air Forces towards expansion on lines which will effect economy and bring about an improvement of Empire communications. The arguments in favour of such a policy are overwhelmingly strong, and a great deal of work has been done by civil and service aircraft to explore the possibilities of various routes and to put some of them to regular use by establishing the necessary bases for supplies. Much remains to be done, but the progress has been satisfactory and has led to valuable improvements in reliability and performance.

Consequent on this, there seems, not unnaturally again, to have been a tendency to seek improvements in performance of aircraft and engines and the equipment necessary (*a*) for controlling countries which are not provided with air forces, and (*b*) for their use in long-distance flights. The result of this has been that little development of armament has been made, and we are still confined to the use of weapons which were in use at the end of the last war and which were quite adequate at that time, as the progress made in aircraft design precluded the use of heavier weapons.

However, the most ardent supporter of the various forms of machinery for ensuring peace in the future would be loth to say at the present time that a war between civilized powers will never occur again; and until, and unless, that can be said with certainty it is very necessary to ensure that all forms of warlike material are developed to the highest degree possible consistent with the development of aircraft performance.

At the beginning of the war of 1914-1918 aircraft were armed with pistols and light rifles, but machine guns started to come into general use in 1915, when it had become evident that air fighting was bound to take place. Up to the end of that war the type of armament was limited largely by the carrying capacity of the aircraft, though there were a few efforts of a half-hearted nature to produce and use alterna-

tive weapons; but there was no general necessity for their introduction, since none of the combatant air forces had obtained very marked results by their use.

If we look into the history of the growth of armament it resolves itself into a struggle on the part of individuals and nations to cause more damage to their enemies at less risk to themselves by producing better weapons than their foes, better safeguards against the weapons of their opponents, and better methods of employing the armament available. Briefly, " a race to go one better " than the enemy.

So far as one can see there is no end to this race in armaments, because, though one may limit, for example, the size of a warship by international agreement, the advance of science evolves new ways of making weapons more efficient, and, indeed, produces entirely new methods of killing, such as the poisonous gas used in the last war.

We have therefore no right whatever to assume that air fighting will be confined to the use of machine guns of small calibre and of bombs (chiefly of the high-explosive type) in any war waged in the future between civilized powers. Aircraft capable of carrying improved armament are available, and the improved armament must follow.

We must realize that the stage of progress of aircraft design reached at the end of the last war was about the equivalent of that of the earliest forms of shipping organized as a fleet for battle purposes. In the same way as the earliest fleets were evolved by collecting all the available craft and making the best possible use of them as "engines of war," so we made use of the best available aircraft, which, in fact, were all those which could fly at all. Progress was rapid in all directions considering that the art of flying was so young, but the war ceased before there was time to make much headway in the design of the large types of aircraft which involve the use of greater power than was readily obtainable at that date.

Comparatively recently there have been successful trials of a large flying boat with twelve engines, which astounded many people by the fact that it was able to lift upwards of 150 passengers and crew and appeared to handle like far smaller craft. Those in touch with aeronautical affairs were aware that progress in the evolution of large aircraft has been going on steadily in various quarters. It is possible to criticize each example of large aircraft as it is produced on the grounds that it has this or that failing as compared with the commoner and smaller types, but it is open to question whether the standards of comparison are apt.

Hitherto we have been hidebound with the idea that for fighting aircraft it is necessary to have a fixed machine gun or guns firing through the propeller in a single-engined tractor, with the addition of a gun or guns on a movable mounting aft in a two or multiseater. In

twin-engined aircraft there are slight modifications to this idea, but the result is much the same, the calibre of the machine guns not varying and bombs being available for all types, but of different weights to suit each.

Now that there are larger aircraft which are capable of taking very heavy loads at speeds comparable to those of smaller types, and of affording a multiplicity of gun positions, it is high time that serious attention be paid to the development of armament generally.

The word "armament" is used here advisedly to include not only the weapons but also the nature of the craft in which they are carried, for it is useless to consider either aspect of the question independently.

Broadly speaking, the aircraft which we now build for fighting purposes—as distinct from bombing—consist of single-seaters having a good turn of speed and power of manœuvre and armed with a small-bore machine gun or guns fixed parallel to the line of flight and capable of firing in that one direction only; relying on the ability of the pilot to place his aircraft in such a position as makes his fire effective.

Such an arrangement is ludicrously crude when it is remembered that *the fact of being able to fire only in the one direction necessarily entails the danger of aircraft colliding owing to convergence when they are attacking the same target at the same time.* This danger is very marked when it is borne in mind that the average effective range of such an arrangement of weapon is about 200 yards, and that no attack deserves to be successful unless it can be carried out aided by superiority of fire or surprise.

If the target being attacked is comparatively small the maximum number of fighters which can attack at any one time, in safety to themselves and within effective range, is three or four, and even then the pilots must be well trained and conversant with the movements of each other beforehand.

Now an aeroplane which is capable of carrying 150 people is capable of carrying, say for the sake of argument, 50 people armed with 50 machine guns, each having 1,000 rounds. These figures are not exaggerated when it is remembered that the average weight of a light machine gun is 20 lbs. and a box of ammunition contains 1,250 cartridges in round figures. Furthermore, these 50 people with their guns can be placed in various positions in a large aircraft, so as to ensure a very heavy all-round field of fire, varying of course slightly in accordance with the direction of attack. The weight of the mountings and gunpits for these gunners in a large aircraft should not add much to the existing weight if intelligent use is made of the structure of the aeroplane, which is necessarily roomy and robust.

Three or four single-seater fighters attacking a large aircraft like that

mentioned above may reasonably expect to have at least 20 machine guns pitted against their six or eight, and, in the less favourable positions, may have up to 40. The single-seater fighters are firing at a large target which consists of personnel, petrol tanks, and such portions of the engines which when hit would cause a stoppage, whereas the gunners in the larger craft have a much smaller target, but they have a vastly superior gun platform and better facilities for aiming accurately and steadily. The multiplicity of engines renders that portion of the large aircraft less valuable as a target than might appear at first sight, and it would be practicable to devote a part of the available load to armouring petrol tanks or to rendering them fire and leak proof, whilst several separate pilots can be available, if required.

We have in the past placed, and we still place, far too much value on speed and power of manœuvre of small craft as an asset for fighting. We have been accustomed to expect large aircraft to be cumbrous, heavy to fly, and relatively slow, but there is no technical difficulty in building large aircraft which will be extremely fast and which will have a power of manœuvre equivalent to the smaller craft when allowance is made for length, height and span.

Ruling out the question of surprise, which is a difficult thing to achieve in the air, superiority of speed and climb for an offensive fighter are only useful inasmuch as they allow the pilot to catch the enemy, deliver a quick attack, and turn away again—if he survives—to await an opportunity of another favourable attack.

Taking all the factors into consideration we must admit that the task of attacking a large aircraft with present-day single-seater fighters is rather a hopeless affair, but it becomes more so if the larger aircraft is armed, as it may well be, with a proportion of guns firing shell at longer ranges.

We have become accustomed to believe that all large aircraft are more prone to bumps in the air than smaller types, but this is due to the fact that hitherto the speeds of larger craft have been low in comparison with the small fast aeroplanes. A large aeroplane of good design having a performance and loading per square foot equal to a smaller one, will in average conditions prove the steadier of the two and will afford a gun platform a great deal more stable than that obtainable in a ship in rough weather.

Again ruling out the question of surprise, there is no reason why very accurate shooting should not be obtained from a large aircraft using guns firing shell, so that single-seater fighters may expect to be engaged at ranges at which no reply is possible with machine guns.

Thus, following the trend of all armament development, it is inevitable that the weight of armament will increase as the size of aircraft increases.

It can be argued that single-seater fighters can bomb a large target such as is presented by a big aeroplane, and that is very true if they can achieve surprise, but it is analogous to asking a torpedo craft to deal with a battle cruiser—a difficult business without the surprise factor in its most complete form.

The development of war aircraft will be a repetition of the development of sea-going craft for the same purpose or, in other words, the production of certain types to carry armament suitable for their intention and analogous to cruisers, battleships, battle-cruisers, light scouting units and auxiliary craft, each designed for its own purpose and best employed on that work.

If we are to retain our lead in the air we must be prepared to set to work at once on these lines and to face the heavy expenditure involved, unless it is feasible to arrange some limitation of the size and armament of aircraft on lines similar to those now discussed for fleets which go on or under the seas, and such a limitation must be so worked that it does not interfere with the future of aircraft as a means of peaceful transport.

Until this limitation exists and can reasonably be enforced it is fatuous to assume that our present weapons are going to be of any use in a future war between civilized powers, and we ought at once to undertake serious production of improved large aircraft with heavy armament of all kinds.

It is probable that construction on these lines will see the doom of the type of aircraft now used as single-seater fighters, though, in a modified form and analogous to fast lightly armed ships, they may have their use as scouting and light bombing craft for surprise attacks, when feasible, or for establishing and maintaining contact with enemy fleets of aircraft until the heavier armament can engage in battle.

The alternative for the air of the torpedo used in the water is the bomb, and for the use of aircraft against other aircraft an incendiary bomb of the phosphorous type, or something of a similar nature, is probably the best class of weapon. But experiments must be made and steps taken to obtain something really satisfactory. In this connection it is interesting to note that in future air battles it will probably become the aim of a commander of an air formation not only to "cross the T" of an enemy air fleet but also to "blot the T" from above, if such a term may be suggested, and it seems rather grimly suitable as depicting the effect of an umbrella of glutinous fire bursting over a target.

To sum up, let us try to adopt the lessons we can learn from the evolution of other arms and apply the knowledge intelligently towards the development of air armament, with all the complications and counter measures that it will involve. But do not let us continue to

confine our attention to improvements of performance of aircraft and engines alone, and to produce fighting craft which will be useless within a few hours of the beginning of another war, unless we can get a workable guarantee for limitation as mentioned previously. Finally, to those who believe that there are limits to the size of aircraft imposed by considerations of the weight of large structures, it should be pointed out that all the experts had proved quite conclusively to their own, and to the satisfaction of many others, that it was impossible for a steamship to carry enough coal to cross the Atlantic before the first steamship crossing had been made.

P. B.

SERVICE AIRCRAFT:
Main Directions of Technical Development

THE disbandment of the 1929 personnel of the High Speed Flight was not unexpected in Service circles once the Air Ministry had announced its official withdrawal from participation in future Schneider Trophy contests, and despite many entirely erroneous guesses in the general Press that it is the intention to make further attempts upon the speed record, the appointment of other officers to the Flight is dictated solely by the necessities of a programme of research.

In fact, the responsibility for this has now been handed over to the Director of Scientific Research, and Flight-Lieutenant J. N. Boothman and the other officers who will join him are in all probability engaged now in carrying out work of a purely scientific character in which speed itself will not be the predominant consideration. For one thing, there is the problem of the extent to which model tests in wind tunnels and predictions upon those results correspond with actual performance, and while much data exists as to the degree of relation with average aircraft speeds, there is not the same certainty when the extreme speeds of 300 miles per hour and more are involved. Mr. R. J. Mitchell, the brilliant designer of the Supermarine Rolls-Royce seaplane, has declared that research is far ahead of practical development, and Great Britain, having demonstrated in unmistakable fashion to the world her technical ability, it is not unreasonable now to devote more energy to the application of the knowledge already won to everyday aircraft and to follow up certain lines of fundamental research impossible in the rush of preparing for the contest last year. The horse-power of the racing type of H engine which Rolls-Royce developed in nine months for the race is now modestly stated to be over 1,500, and we must respect the reticence imposed, though it is common knowledge that it developed much more than that figure. The racing Napier Lion engine, which never developed its full power in the Gloster seaplane owing to an obscure trouble connected with the air flow over the carburettor intakes, has been the subject of some further work at the Napier works, and is now declared to develop 1,275 h.p. at 3,600 r.p.m. for a weight of 1,130 lbs. This includes gear reduction and supercharger, and represents the very low weight of .889 lb. per h.p., and as the power mentioned does not, one may suppose, represent the maximum possible with further development, the weight may yet be even more favourable.

High-Performance Aircraft.

Turning now to matters more intimately associated with the Service equipment, it is interesting to record that two of the new Interception Fighter class have successfully passed through the Martlesham Heath experimental station and are now with squadrons undergoing that period of further trial under day-to-day conditions which is such a valuable feature of the policy by which new equipment is finally selected. These are the Fairey Firefly and the Hawker Hornet, both single-seaters which were seen at the Aero Show at Olympia last year, and if all I hear is correct, the competition between the two types will be very keen. Both bear unmistakably the impress of the firms whose names they represent, and while the aircraft themselves are still on the Part Publication List, it is probably permissible to say that each is capable of a speed of at least 200 m.p.h. at great altitude. This is a notable achievement, allied as it is with fast climbing ability, and in all probability there is no other air force in the world which has machines of such high performance combined with the severely practical lay-out of the equipment always insisted upon in the Royal Air Force.

It is unfortunate that Service requirements prevent disclosure of how good these two machines are. Both aircraft are fitted with the Rolls-Royce F engine, and observers of the development of the past few years cannot fail to be struck by the way the production of this new type, and particularly its successful supercharging, has given a new turn to the long rivalry of the water-cooled and radial air-cooled engine. Practically all the new experimental land aircraft of the high performance type have this engine, but the Bristol Mercury supercharged radial has not yet shown its full powers. When it does the struggle for supremacy will be intensified, and in certain classes of machine it may be preferred. It seems clear, though probably the radial enthusiasts will fight hard to resist the conclusion, that the water-cooled type enables marked superiority in speed to be obtained at the expense possibly of some diminution in the rate of climb—though it would be unwise to dogmatize here too closely—while the lighter weight of the radial may sway the balance so far as ships' fighters are concerned, apart altogether from any question of ease of maintenance. So far as power is concerned the radial designers are steadily keeping pace with anything accomplished by their rivals. The latest Armstrong Siddeley Jaguar still returns its h.p. at 450, but the Panther, sometimes called the Jaguar Major, is rated at 500 h.p., the Bristol Mercury at 540 h.p., while the Rolls-Royce H engine of 750 h.p. is matched by the Armstrong Siddeley Leopard of 650-700 h.p. Actually, horse-powers these days are rather misleading unless they are accompanied by a statement of the height at which the power is

developed, for supercharging has entirely altered the position, some engines developing greater power at height than is possible at ground level.

Evaporative Cooling.

Another technical advance which may come sooner than we expect is evaporative cooling, in which the main water supply is in the jackets of the engine only, and as the water boils the steam is led into suitable radiators which are, in effect, the leading edge of the wings. Evaporative steam cooling is being used very successfully on the new State airship, R101, at least one aircraft firm is making good progress with its application to aircraft, and the Royal Aircraft Establishment at Farnborough is also tackling the problem. The prize of success is well worth winning from a military point of view; the pilot no longer has his water temperature to worry about, the cylinder temperature can be kept nearer the point of maximum thermal efficiency, the resistance of the water radiator has disappeared—that is if wing radiator cooling is employed—and in a fight the puncture of the radiator means the loss of steam at atmospheric pressure instead of water. Already flight tests of over twenty-six hours have been carried out at Farnborough with a standard aero engine, and wind tunnel tests have shown, as might be expected, that the highest rate of heat dissipation is realized in that portion of the wing ahead of the front spar.

The Hawker Hart High-Performance Day Bomber.

The first production order for new aircraft this year goes to the Hawker Hart, and No. 33 Squadron will be the unit to have this high performance day bomber, which from all accounts will bring joy to the pilots handling it. The figures of the Hart will be of interest, and are as under:—

All-up weight, 4,320 lb. Disposable load, 1,824 lb.

Speed at 5,000 ft.	177.5 m.p.h.	Climb to 5,000 ft.	3.54 min.
Speed at 10,000 ft.	172 m.p.h.	Climb to 10,000 ft.	8.36 min.
Speed at 15,000 ft.	163 m.p.h.	Climb to 15,000 ft.	15.54 min.
Speed at 20,000 ft.	139 m.p.h.	Climb to 20,000 ft.	32.4 min.

The Service ceiling is 20,700 ft.; the Hart lands at 62 m.p.h., has an endurance of four and a half hours and a range of 600 miles. The span is 37 ft. 6 in., the length 29 ft. and the overall height 10 ft. 9 in., while the wing area is 350 sq. ft. The engine is the Rolls-Royce F.xi.B. geared type. The construction, of course, embodies the Hawker patent system, which is undoubtedly simple to build and light in weight. The general principle is the use of round tubing, flattened at points of junction into square shape and joined by flat plates and hollow tubular rivets. Considerable care has been taken to ensure good accessibility to the engine, the cockpits are well sheltered and all

controls and instruments are within easy reach. The seats are designed to take standard parachutes and the pilot's seat is adjustable in the air, while the observer's seat falls back to give free access to the prone bombing position. The disposition of the military equipment will be found to be most carefully thought out, and the type should be popular both with pilot and observer.

Every effort has been made to provide the pilot with the maximum view, and the main planes are of the single bay type with top centre section only. This is supported from the fuselage by four outwardly inclined steel streamline struts well out of the line of the pilot's forward view, while the centre plane struts are arranged in " N " form and are of tubular steel of streamline section. The wing spars are built up of steel strip, the two rolled booms being connected by a fluted web; the ribs are of duralumin and the wing section is R.A.F.28. Ailerons are fitted on the top plane only, are of the differential type, and are balanced. The tail plane is adjustable, the hand wheel in the cockpit being linked to a graduated scale. The controls are of simple design, all the cable leads are very direct, and arranged to cause the minimum of friction. Fore and aft adjustable stirrups are fitted to the pilot's rudder bar, and an auxiliary connection for the observer's use is fitted at the side of the bombing hatch.

There are two fuel tanks, one situated in the centre section, holding 20 gallons and feeding by gravity, and the other with a capacity of 67 gallons, supplied with engine and hand pumps in the fuselage. The oil tank, with a capacity of seven gallons, is under the main fuselage tank, and all tanks are made of welded aluminium or tinned steel. The usual armament is carried.

Flying Boats.

Considerable attention, seaplane pilots will learn with interest, is now being paid to flying-boat development, and it is unfortunate that official regulations prevent more than a hint being given of what is in progress. The definite aim of policy is to produce a flying boat with a range of 2,000 sea miles, sufficient to enable such an aircraft, in an emergency, to fly from England to Australia, calling only at British bases *en route*. Meantime, another Blackburn Iris has just been launched. Then there is a new Blackburn flying boat on the stocks, the *Sydney*, which will break new ground, as it is to be a high wing monoplane of the semi-cantilever type, with wing floats set rather close in to the hull to reduce stresses generally. The fuel will be carried in a streamline section connecting the top of the hull with the wings, and the three Rolls-Royce " F " engines will be faired into the leading edge of the wing. The tail plane is also monoplane in form, with three rudders, and the hull is large enough to enable a rear gunner's cockpit to be placed at the extreme tail.

Engine Carburation.

There are certain improvements in engine carburation which seem now in sight, and one advantage of the fitting of the flow meter of the type which has already been successfully experimented with in the Service is that pilots will be able to use their altitude control with more exactitude. This will save petrol, and while perhaps the Treasury will be more interested in this aspect than the pilot, it does mean from the Service point of view that the maximum range can now be secured with reasonable certainty from a given fuel load. At present, there is always a risk, if the altitude control is opened too wide, of the mixture getting so weak that burning of the valves will follow; but once sufficient experience has been gained with the flow meter, it should be possible to say that at a certain number of engine revolutions the consumption should be so much, and this will materially assist the pilot to gain the maximum advantage from the altitude control without exceeding the safe limits. Then the pump type of carburettor, already being used on motor cars, is being applied to aircraft carburettors, and whereas now all carburettors are set on the rich side in order to provide that extra gulp of petrol when the throttle is suddenly opened, with the pump type smaller jets can be used, as the tiny pump injects just that little extra fuel which is wanted for acceleration.

A more accurate standardization of fuel is now being obtained, the Service will be interested to know, by abolishing the chemical formula or the specification of a certain percentage of aromatics. Instead, every fuel accepted for the Royal Air Force must be able to develop full power in an engine of six to one compression ratio without detonation. This is ensured by every batch of fuel being put through a standard test engine. Here it is compared with a standard fuel which it is known will not detonate under the required conditions, and every bulk supplier is required to have one of these test engines. This should mean that approved fuel will function properly anywhere in the world in any Service engine.

Navigation and Control.

Attention has been drawn to automatic aids to aircraft control by the experiments of Lieutenant J. H. Doolittle, in America, who, flying a machine fitted with instruments developed by the Daniel Guggenheim Fund for Aeronautics, took a course away from Mitchell Field, turned, recrossed the field, turned again and came back to land a short distance from his starting point, being the whole time shut up in a totally enclosed cockpit. A second pilot who could see was in the rear cockpit in case of accidents, but he kept his hands hanging over the side as a guarantee of good faith. A number of instruments played a part in this most successful experiment, among them being a new form of

gyroscopic compass, an extremely sensitive altimeter registering the correct height within a few feet, and an instrument embodying an artificial horizon, which seems a big advance on anything yet devised. A new short-range radio-beacon helped materially to the location of the landing ground; this casts a ray fifteen to twenty miles long in two directions, and an aircraft flying into the beam sets one of two reeds on either side of the instrument board vibrating according to whether the deviation is to the right or the left. The exact position of the beacon is known, and Lieut. Doolittle, when he was directly over the beacon, flew on for two miles, as reckoned by stop watch, came back, and made a perfect landing.

It seems, however, from a section of the report, that this was only attempted with an inherently stable aeroplane, and too much importance should not be attached to a carefully arranged experiment. The Royal Aircraft Establishment, less ambitious, has, however, now brought to practical success an automatic pilot—or " Pilot's Assistor," as it is officially called—which is going into production. It is guaranteed to control an aeroplane far more precisely than can the most skilled human pilot, and it has worked with equal success in two-seaters, big twin-engine night bombers, and flying boats. The basic control is a gyroscope which is driven by compressed air generated by a wind-driven compressor. The same source of power is used to actuate small pistons linked to the elevators and the rudder. Once a course is set the " Pilot's Assistor " will maintain that course, and in tests, machines have been flown 400 miles without the controls being touched once. Of course, any change in the wind means that the course must be reset, but in night, cloud, or fog flying, the mechanism can be relied upon to keep the machine proceeding truly on a level keel.

There is a cock on the dashboard which the pilot can turn to cut off the pressure; and in case this should ever fail there is an emergency pin in the pipe-line the pulling out of which at once releases all the air in the system. A squadron of Vickers-Virginia night bombers is the first unit to be fitted with the device, and, of course, it will have a definite military value in that it will save the pilot becoming fatigued on a long flight and leave him fresh for his real job of work on reaching the objective. It seems also that in a national emergency the " Pilot's Assistor " will enable quite an appreciable dilution to be made in the flying efficiency of a rapidly enlarged force. Experienced pilots could lead formation made up of men able to fly but not yet really skilled in the art of navigation and course finding, for the mechanical device would make up for their relative lack of experience, and, incidentally, save the leader much anxiety in shepherding his flock on a long-range raid.

C. G. C.

FOUR hundred miles of silt surrounding, and produced by, two rivers. This sums up the whole physical geography of Iraq. Wherever the land lies appreciably above sea-level some other nation is found. Wherever the fine silt blends with the song-writer's sands of the desert, all national coherent life is lost. Man's settled efforts are confined to within a few yards of river, stream or canal. For the nomad, like the North American Indian of old, is the despair of the economists, a unit requiring hundreds of acres per head of the earth's surface whereby to support a precarious existence.

There is no other country but has its hills and plains, its strong uplands and deep-set meadows. Iraq alone has this uniform configuration, rivalling a block of council houses in its deadly monotony. Nature bestowed, however, an extreme fertility to the soil, and here Man for centuries perfected his civilization, raising from these mud flats his dream cities to the skies. Babylon, Nineveh, Ur, Baghdad and Basra meant more to the world of their day than any modern capital to our international times. The great conquerors in turn forded these life-giving but tactic-wrecking rivers, and rarely was the world drama of the rise and fall of Empires played out without one scene being staged in Mesopotamia.

The monotony, however, is more apparent than real. No country which is inhabited by three different races of violently opposed religious views can be really dull. The physical discomforts are not so great as they are painted. It is true that the heat at Basra, especially at night, is greater than in any part of India, but it is dry and easily endured. The greatest disadvantage in comparison with India is the lack of hill stations in which to recuperate. A settled Persia would solve the question.

The entry to Iraq from the sea is not impressive. The blue waters of the Persian Gulf give way to a muddy liquid, two large buoys are seen ahead, a low coast appears in the offing and the Fao bar is

reached. The ship is soon between converging banks fringed with date palms, and the Shatt-el-Arab has been entered. To port, the signal station of Fao marks the first landing of the war. To starboard, the land is Persian. After passing the oil-tank town of Abadan, the Karun river comes in at Mahomerrah. This is one of the beauty spots of the delta, and here the Anglo-Persian Oil Company have built comfortable bungalows for their service employees. When the traveller has passed Mahomerrah he turns his back on the only oil-*producing* area in these parts.

Basra, the second city of Iraq, lies on the western bank. It consists of four townships: Ashar, the old port; Basrah city, a mercantile community a mile and a half; Makina, and the British-made port of Margil.

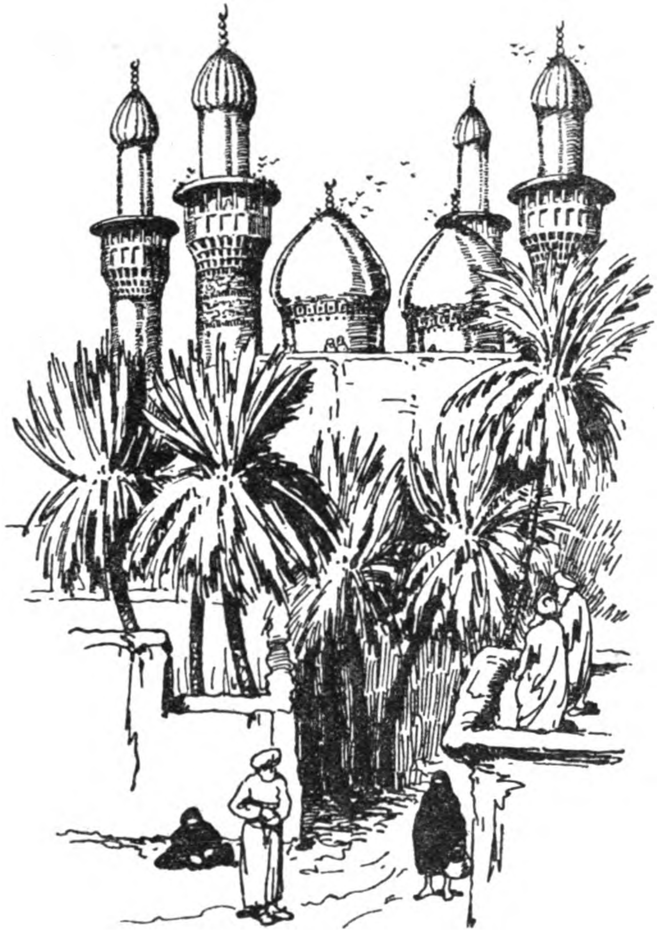
All these are both divided and connected by tidal creeks, which carry the life-giving water into luxurious gardens, and afford a picturesque method of travel.

As life in Iraq is tied to the waterside, the boats and river craft are of interest. Basra has developed a type of its own—the *bellum*. This is a long double-ended boat constructed for poling in the creeks and paddling in the deeper water of the Shatt-el-Arab. The *bellumchi* places planks at each end to run along while poling like the wherry-men of the Norfolk Broads. A stem and stern-post complete the resemblance to a gondola, and these graceful craft have earned for Basra the title of the Venice of the East.

Here, too, is seen a very fine piece of naval architecture, the ocean-going *dhow* built for trading down the Gulf to India and Africa. The Arabs were among the earliest scientific navigators. They would make their landfalls across the uncharted oceans while their rivals laboriously hugged the headlands. The builders of *dhows* are evidently descendants of these old sea-dogs. Their vessels show lines that delight the yachtsman. This in a country where all other carpentry is of the crudest.

The *meheila*, or river barge, is a disgrace to its owner and maker. A rough, unfinished contraption with masts, yards and tiller fearfully compounded, *à la* Heath Robinson, of odd lengths of untrimmed spar. A nightmare of a boat.

Farther upstream, at Baghdad, a normal ferry-boat is in use, but the fishermen and farmers alike use the *gufa*. This is a round coracle built entirely of the midribs of the palm leaves, covered with skins and rendered with bitumen. Into the latter, whilst setting, are worked patterns in stones and shells which register ownership and avert the evil eye. The *gufa* has an immense carrying capacity, but no steering properties. It is the natural product of a plethora of palms and a dearth of wood.



The Golden Towers of Khadhimain.

The lack of wood explains another curious craft, the *kelek*. The dwellers on the upper reaches of the Tigris find a good market for their firewood in Baghdad. They accumulate faggots and dried skins. The latter are tied up and inflated and form the pontoons of a raft, the deck of which is composed of the faggots. A little shelter is built on top and the speculator lazily drifts down to Baghdad, demolishes the raft, and sells skins and wood.

Basra is best explored by *bellum*. On going up to Ashar creek an ancient house is pointed out as the house of Sinbad the Sailor. Unfortunately the gentleman never existed, the house is not two hundred years old, and in those mythical times Bussorah, as it was usually spelt, stood eight miles to the west. The bazaars of Ashar are not impressive, but occasional treasures are to be picked up there.

Around Basra and Ashar the fertility of the soil produces the most luxurious gardens. At the head of the creeks are a network of smaller canals, bridged over by the half trunks of fallen date palms. There the land is cut into very small holdings and the fellaheen work by day and moonlight night, ladling water up by means of the balanced bucket or *shadhoof*. The vegetation is luxuriant. Enormous melons and bunches of white grapes are seen between flowering masses of bougainvillea.

At the head of the creek lies Basra city, mainly inhabited by Jews.

The Jews of Iraq are very true to type. They are peaceful and prolific, and very trustworthy in business.

Very full of efficiency is the young Jew. He will do a year in the Customs office or some other Government department, a year with a merchant to learn business methods, act as runner to Arab tradesmen to develop salesmanship, and then he's ready for business on his own. Commerce and the founding of a family are his aims. He can produce a business smile, but never laughs, and is scared stiff if he finds himself five miles outside the city walls.

They remain rigidly conservative in their dress. The gaily coloured *abbas* of the younger Jewesses determine the efforts of the weavers of Nejf and Baghdad as surely as their elders' taste in velveteens makes an annual demand on Manchester. A happy race to whom fashions are unknown.

Makina, the third component village of Basra, means, in Arabic, "machine." The first steam-engine ever seen in Iraq was erected in the liquorice factory here. The British requirements caused the building of the port of Margil. It was found that deep water was to be found close up against a marshy area. A *bund* was built to protect the low land from further inundations. What was a snipe-inhabited swamp is now dry desert, and the climate of Basra altered for the better.

West of Basra lies Shaibah, the first Air Force station to be met with. This was originally erected as a locomotive depot when the railway schemes were on a more optimistic basis. Shaibah lies be-

hind two low ridges that mark the Turkish positions in the battle of that name. The intervening desert was then inundated and *bellums* were used for the first time to carry infantry to the attack.

General MacMunn, in his recent work on Afghanistan, considers that the friendly neutrality of that country during the Great War could not have been maintained if the decisive victory of Shaibah had not occurred.

One may return from Shaibah through Zobeir, an interesting little walled town. The Bedouin proper will not enter the larger cities, but seeks those smaller market towns on the fringe of the desert, where he can buy and sell in a more bucolic *mise-en-scène*. Almost African in

its atmosphere, it possesses but one large market place. The Sheikh of Zobeir, who favoured the British cause, was allowed to retain a semi-independence, dealing out justice and exacting his own tolls. When the malefactor in Basra was formally tried by British-Indian methods he was better off than his fellow crook in Zobeir, who was liable to have a hand struck off for stealing. The Sheikh could have stopped the outbreak of motor bandits at a tenth of the cost of a Flying Squad.

Between Zobeir and Basra are mounds of old bricks, among which old pottery can be found. These represent the Bussorah of the mythical Sinbad the Sailor, the river having since changed its course.

The next Air Force station is Baghdad, and it may be reached by air, rail or water. As the rivers make Iraq, the journey up the Tigris should always be undertaken once, if only to understand Townshend's and Maude's stupendous difficulties.

Immediately above Basra the Euphrates comes in on the left bank. The next village on the Tigris is Kurnah (Qurnah), by tradition the seat of the Garden of Eden. One is shown the original Tree of Knowledge. Some fifty yards away its successor is being reared, in case of accidents.

Next come the Narrows, a portion of the river marked by serpentine loops that are so complex that it is impossible to say if an adjacent steamer is above or below one, and whether it is ten minutes' or two hours' steaming away. The sharp bends and swift current are coped with by equipping the steamers with a barge on either side. Using these as a fender, the steamboat bumps and tosses its way round these fearsome bends. The river is haunted by the fiercest flies and mosquitoes. One atrocity with yellow stripes can only bite through clothing. He fastens on a stocking with all feet, takes a deep breath and plunges in his proboscis.

The people of these parts represent the lowest type of Arab. They are seminomadic, moving ground according to the height of the water. Their huts are built on a foundation of bamboo-like reeds which are planted in parallel lines of bundles. Each pair of bundles are inclined inwards and tied together to form a Norman arch. They are roofed with camel skins.

The women, who are unveiled, are of magnificent physique. With the young of the tribe they pursue a boat in order to sell chickens and eggs. The men are noted thieves in a country of experts.

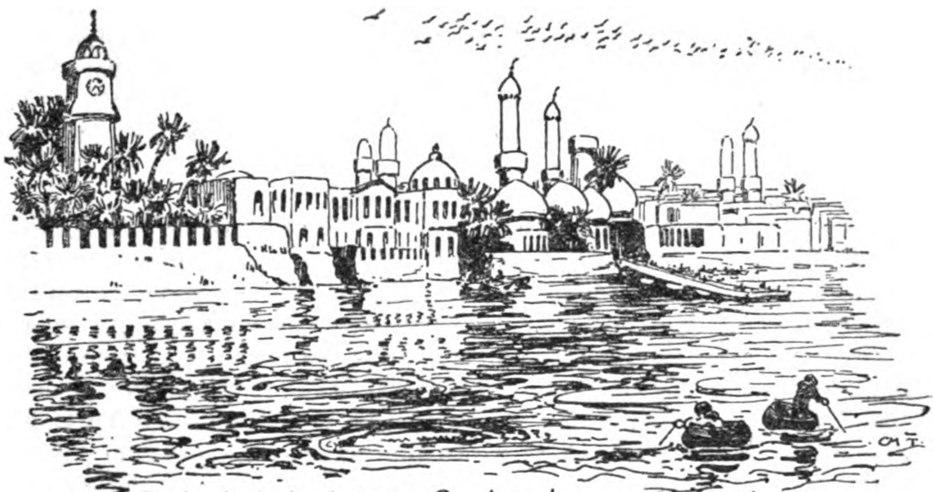
A more civilized region is found at Amara. This pleasant little town enjoyed a wartime boom. It was made into an advanced base, with a ration strength at one time of 90,000. It enjoys a milder climate than either Baghdad or Basra, and affords excellent black-partridge shooting.

Farther up we reach Kut, a small riverside town which still bears the marks of the famous siege. On clearing the town the gigantic arch of Ctesiphon forms a landmark for miles. Outside the mosque there is not a building in the country of such pretensions. It is astounding to think that a modern battle can have raged round its base and that such a perfect observation post was not destroyed.

Above the mouth of the Diyala tributary, with its memories of the heroic Lancashires' crossing, the river skirts Hinaidi, the Air Force cantonment of Baghdad. The choice of a site below a native city is due to the fact that most of the land above the city is very liable to inundations. The Tigris in its upper part runs above the level of the country in flood times borne in a *levée* formed of its own deposit.

The modern city of Baghdad lies mostly on the east bank of the river. Two boat bridges connect it with Baghdad West, which comprises the railway quarter, the Residency and the old Turkish military

hospital. In its native quarter is found the oldest mosque of Baghdad, and stone slabs bearing Babylonian inscriptions may be seen at lower water in the protecting bund at this point. To the north lies Khadhimain. This glittering splendid mosque has four slender minarets which rise as if to protect the twin golden domes. Their symmetry is unusual. Many of the minarets of Baghdad have settled out of the perpendicular and lean like the Tower of Pisa until the Waqf authorities hurriedly pull them down and re-erect them. The older monuments are left to lean dangerously. The beauties of Khadhimain can be seen from neighbouring roofs. Near view is



Kotah Bridge, Baghdad.

difficult, as the fanatical Shiah population resent sight-seers. Nowhere in Baghdad is the free entry to mosques encouraged, as in Cairo.

Baghdad East is a fanciful mixture of ancient and modern. Formerly a walled city, the old ramparts are maintained as a guard against inundations. From the south to the north gate a broad new street was driven by the Germans in 1916. The efficient Hun was undoubtedly worried by the traffic delays in the old street. The old main road was a narrow, muddy lane, running parallel to the river and connecting up the mouths of the various roofed-in bazaars.

Here is the city life of the East. Long lofty galleries roofed in here with masonry, but mostly with rafters covered by canvas or beaten-out kerosene tins. Trades tend to congregate. Several side tributaries are given up to *Kumash*, or Manchester cotton goods. Antiques, brass-ware and carpets are sold all along the grand bazaars, where the collector bitten with the carpet craze will hunt assiduously for his

bargains. Patience and knowledge will be rewarded here. The usual product of the Persian factories is offered at a rate slightly higher than it can be obtained in London. An older specimen is cheerfully labelled "antique," and a fabulous price is asked. But most of the dealers are quite ignorant of the value of a real old piece, and thrust it on a customer for what he will offer. The assiduous gold and silver workers work in a separate bazaar reached by a single narrow archway, a precaution against grab-and-run miscreants. A few yards away the coppersmiths turn one long alley into a pandemonium, whilst the shoemakers and Amara silver workers all congregate into their several areas. Here one meets a sample of the nations. The traders are Arab, Persian, Armenian and Jew. Down the street come the Kurdish coolies carrying the heaviest weights with impunity, whilst his fellow-tribesman strides through wearing an enormous busby-like hat, his body hung with armaments like a Zane Gray cowboy. Mullahs and notables stroll by, conscious of their dignity. The young Jew clerk is on his way to his office.

One figure is never seen, the real Bedouin.

The main bazaars are buttressed in part by the custom house, an old Arabic school containing much interesting architecture. In all Baghdad the older buildings are hemmed in by the shoddily built fabrics of a later day. Still farther north after passing the upper boat bridge, the Serai or government buildings forms an exception, by standing clear of the neighbouring streets. Still farther north is the citadel, a long grey building, whose entrance contains an old Turkish cannon covered by strips of rag. In this older country sterility is a curse for which modern science can do little. In Baghdad the seeker after maternity ties an offering on to this cannon, but on the creeks of Basra egg-shells are floated down the ebb-tide after due invocations. Mahomet never conquered the innate fetichism of the East.

Still farther upstream the new Civil Hospital has been formed from a rest pavilion built for the Shahs of Persia on their pilgrimages. Baghdad not only stands at the junction of the river traffic with east and west caravan routes. It has a further importance in possessing a very important Shiah shrine in Khadhimain and in lying on the direct route from Persia to the holy cities of Nejf and Kerbela. So streaming in through the north gate they come every autumn, on camels, donkeys, and afoot. A hooded palanquin bears a veiled Moslem lady. This donkey bears corded bundles on either side. One will be a roll of rugs to be sold to defray travelling expenses, the other will be the dessicated corpse of the family, to be laid as near a holy shrine as finance will permit. The Shiah will toil all life through to raise the rupees for this last adventure. Every year the pilgrims perish of starvation and exhaustion on the road, but their numbers never

diminish. This pilgrimage explains the turning up of real antiques to-day in the dealer-ridden bazaars.

From Baghdad to the north-east one can go by road or rail to Persia, passing the oilfields of Khanikin. Going north by west, the rail runs to Shergat, from which a rough and bandit-infested road runs to Mosul. The latter as an Air Force station has some advantage. It has a greater variety of climate, the winters being cold. Also, like Peshawar in India, it is essentially a frontier station and more likely to play a part in small operations. It is a town whose glories have departed. The east and west caravans use Baghdad more and more, and the importance of Mosul is likely to lessen, unless the magic oil brings a new prosperity.

Each Air Force station has a wealth of antiquities in its neighbourhood. Shaibah is but a few miles from the Ur of the Chaldees, Mosul is the starting-point for the ruins of Nineveh. Near Hillah, on the Baghdad-Basra railway, are the well-known ruins of Babylon. Certain trains are stopped for would-be sightseers, the ruins being only a few minutes' walk from the railway. Iraq must have been equally hot in Babylonian days. The first impression, as in modern Baghdad, is of the narrowness of the streets compared with the status of the buildings flanking them. The tourist looks down on the Assyrian carvings walking over a mound from which the streets have been dug out. There is now a movement on foot to house further antique discoveries in a museum at Baghdad.

The holy cities of Nejf and Kerbela are rarely visited by Europeans, so that the two years' sojourn in Iraq will exhaust the local interests more than ten years would in India.

Service life in Iraq presents for amusement the usual tennis, riding and dancing. Bathing in the muddy Tigris can be undertaken with care. Sharks run up as far as Baghdad. One sport offered in abundance is small-game shooting, which can be obtained at all stations without too much travelling.

The season starts with the sand-grouse, who can be shot after September 1st. This close season was unnecessary, as the birds only come in from their desert nesting-places a few days before that date. They migrate from west to east and *vice versa* in thousands, columns several miles long being sometimes seen during their spring emigration. October 1st ushers in the black partridge, found in the cultivated gardens and tamarisk and cotton plantations. They are intensely local and can be soon shot out, so early and good information is necessary to get a bag.

Later on in the year come the snipe and duck. The flooded grass meadows are the best snipe grounds, giving plenty of shooting with shallow wading. The duck are of infinite variety, three kinds of teal,

ruddy sheldrake, wigeons, pintail and mallard being all found on the same ground. Geese are plentiful round Basra and on the higher reaches of the Diyala above Baghdad.

Larger game are hardly worth mentioning. The practice of shooting gazelle from cars is forbidden. There are plenty of wild boar, but not in country that admits of pigsticking. Met with in an ordinary day's shooting, they are at once a nuisance and a danger. The boars are ready to charge an intruder, and take a lot of killing.

The country therefore presents a good many amusements to those who have to serve there. Probably the greatest interest of all lies in its politics. This is no place to discuss mandates or forms of government, but an acquaintance with the varying peoples and religions that make up the three million population will make the resident heartily glad that he has not to find a formula to please Shiah and Sunni, Jew or Christian, Sheikh and trader alike.

A WOMAN'S PARADISE IN BAGHDAD

By Jane Purves.

Except perhaps in Nishni Novgorod in fair-time, possibly also in old Constantinople, there can be no bazaars in the whole wide world to equal those happy haunts of bargain-hunters in Baghdad.

These bazaars, or sûq, are really narrow streets of tiny khans, mostly very little bigger than roomy cupboards, roofed in overhead with roughly octagonal Moorish arches. Here and there the sûq runs through the remains of some once-important building. Walls of marble brought down by kellick or raft from the Persian hills by some long-dead Khâlif have a forlorn air of past grandeur surrounded by the matté walls and battered tin roofs of to-day. It is best to walk through the sûq, though sometimes a mule or pony is led through the surging crowd. The khans are never level with the street; they are either one deep step up or two down, for the pathway outside has been built up by one sandstorm after another, each leaving a thick coating of fine silt behind. Old houses fall down as the underground rooms cave in; the rubble is left where it falls. It is so much cheaper just to tread it down rather than cart it away.

The cheapest sûq of all is known as the Thieves Bazaar, a part in Fountain Square in the north of the city. Thieving is so inborn in the low Arab's nature, and so common a thing, that penalties are terribly severe on both thief and receiver if caught. It is said that the city thieves get rid of their loot in Basrah, and those from all other cities make Baghdad their clearing house.

Anyhow, the most extraordinary bargains are sometimes obtainable here. There are three inveterate and successful bargain-hunters among the hundred memsahibs of Baghdad. From the unfailing way they seem to pounce on the best bargain in each khan, and get it at their own price, you would think the Arab dealer credited them with "the Eye" and was willing to get rid of them at any price. Everyone envies them. Their homes are filled with the loveliest carved teak furniture, old embossed silver, Persian brass and enamels. Beautiful sherbert bowls which in America or England would be reverently posed on teak-wood pedestals are there in daily use, hold-alls for household odds and ends.

Unless there are young children to supervise, which is a twenty-four hours' job every day for a real mother in such a careless country as 'Iraq, a memsahib in Baghdad has every morning free for bargain-

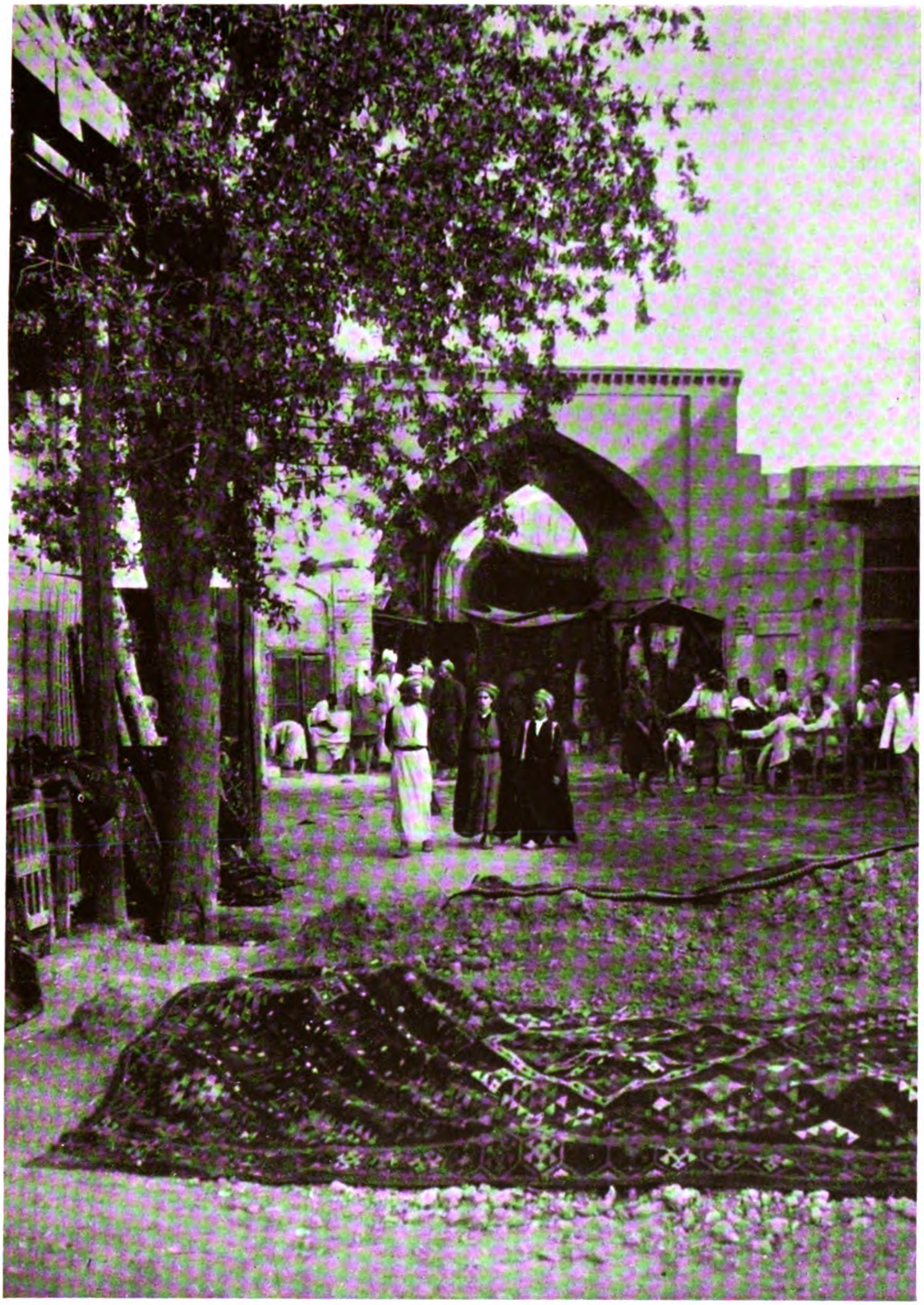
hunting, from nine till noon, and often another hour or so after tea, if the scent is really hot. After you have paid a dozen visits or so to a dealer, and he sees that rubbish is unsaleable in this quarter, he will not love you so much, may, indeed, salaam you less, but will respect you more. Better rugs and brass are brought out, and much lower prices asked. Three very good dealers, however, have now adopted the European plan of a fixed price from which they will not budge a rupee. They also sell no rubbish. You are sure of getting a good thing at a hundred per cent. over value, but, on the other hand, you are never " had." This appeals to the man in a hurry, passing through the city on his way home on leave, but where is the thrill for the memsahib hot on the trail of a bargain?

She prefers to spend weeks bargaining for some coveted rug or Persian enamel, pulling the price down Rs10 a visit. Sometimes the prize is swept away as the hand is stretched out to grasp it, but, as a rule, it is quite possible in time to buy really good things for half as much again as the dealer paid for them. And *he* buys in very, very cheap markets.

The crowds themselves in the sûq are as wonderful as the goods sold. Through the press come the slow-moving Arabs, brown-robed with different coloured turbans to mark special characteristics. Here is the gold-patterned white turban of the teacher at the Mosque school. There the tight-bound, grass-green turban of the descendant of the Prophet, whose family has grown as the grain of mustard seed. Now, a spotless-white turban peculiarly folded tells the world that here is a true believer who has made the pilgrimage to holy Mecca. These people all draw their robes tightly round them as the white sahib and his memsahib pass, lest they be defiled by the touch of an unbeliever.

A group of town-bred Arabs amble past, with chêfiyahs of checked cotton made—also for romance!—in Manchester. Half a dozen Persians follow—handsome fellows with clean-cut features a film-star might envy. They wear long black coats kilted from waist to ankle, with large black turbans wound about by coloured striped-silk shawls, drooping fringes of which often hide the face. Their women walk behind, at least two to each man, shrouded from head to foot in a veiling of black silk crêpe de Chine. Only their graceful slim feet beneath hint at hidden beauty.

Here swaggers a fierce Kurd with a still larger black turban, looking like those people in " Alice " who wore inverted saucepans on their heads. These large box-like turbans, as big as a bearskin busby, are intended to delude the enemy into shooting too high, while the wearer is hidden behind a rock—rather a naïve idea for the twentieth century! These Kurds wear lovely silk shawls of striped Persian silk about their waists, with many a curved knife thrust into them. Guns and



A Corner of the Carpet Bazaar, Baghdad.

pistols are not allowed in the city by day. At night, however, the nâwatir, or watchmen, in the sûq are each armed with old muskets or rifles, and fire them off at all abroad without a lantern. A popping goes on all night suggestive of bombardment.

A string of Persian coolies trot by. They are merry fellows and will do anything for a master who jests with them. Their handsome faces, brown as a coffee-bean, with blacked bobbed hair under a conical white hat, their bare, brown arms and legs with rags of blue cloth and dirty sheepskins for covering make them stand out in the crowds surging along. Alas, as they rarely wash and always sleep in their duffle in any dirty corner, one gives them as wide a berth as the crowd permits!

Here and there flit black-veiled, bare-footed Arab women of the lower classes, showing a khōl-rimmed eye or half a face, according to the power of the mother-in-law at home. Each of them wears a gold and turquoise nose ring, with many necklaces of blue beads and Koranic amulets to ward off "the Eye," with anklets of silver bells about their tiny bare ankles.

Sometimes way has to be made for a Chaldean priest of importance to pass with his lesser priests bearing cymbals. A wonderful bird of Paradise this, though rarely seen, with his brilliant robes of thick fuchsia-coloured silk over a much-jewelled under-robe, and an enormous black silk hat, two feet across, like a large flat cake-tin on his head.

Every sûq surges with an undertow of chattering Arab kiddies. Under one's feet they dash, sometimes between those of a very tall sahib! They shout at the top of cracked, raucous voices to friends but a yard away. Merry little grigs they are, and impudent, copying peculiarities of walk or gesture of passing sahibs until cuffed out of the way. Cuffs and kicks are their daily portion. No one seems to own them. They lie down and sleep in any out-of-the-way corner. Kindly souls give them half a khubz, or crisp-bread, a bit of egg, a lettuce leaf or two, a handful of dates. They feast happily, squatting in the dust and sun, smothered by flies.

The air reeks with the smell of burning ghî from tiny public kitchens of five saucepans and a single stove, or with bad odours from a heap of rotten food thrown out from some café. There comes a whiff of sweet amber as an exquisite passes fresh from ablutions, or garlic from a group of squatting coolies. Sweating mules shove their way along, loaded with packs of untanned leather. A wave of hyacinth or muguet refreshes us as swaying Jewesses in their gorgeous silk ubi or sleeveless wraps mince along, peeping at us under their black-gauze shutters as they pass. Over all is the slow stench of hot unwashed humanity.

And through it all, wherever there is a deal to be made or a rupee to be split, as carrion crow to the corpse, hurries the red-fezzed Jew in his Western clothes. Through it all rings the cry of, " Flūs-rupea, rupea-flūs "—Money, the leit motif of the Baghdad Jew.

When you grope your way up narrow, unlit stairs, with uneven steps, sometimes two feet apart, to little upper khans, you are greeted with many smiles and salaams. " *Salaam aleicum, memsa'ib* " (" Peace on you "), to which you invariably reply with an uplift of the hand, " *Wa aleicum es salaam* " (" And on you, peace."). You are salaamed to the couch of honour, wooden, but piled a foot deep with rugs. Here you sit, perched high with your feet tucked up, while long-stemmed Arab cigarettes and sweet hot *chai* in little glasses are offered to you. As these glasses are rarely washed from one customer to another, it is best to leave the tea alone.

Your true Arab dealer never appears to know any English at first, neither do you confess to any Arabic. All bargaining is conducted by that wily person, the Jew runner. Sitting cross-legged on the floor beside you, he shakes the rug corner-wise to give a richer effect of bloom or patina to the beautiful colours, keeping up all the while a running patter of stock phrases common to every runner.

" Oh-h, memsa'ib, this is a good rug—better than mooch gold—Sister! I should like to sell you this rug. You are my fren'—to-day is a good day to do business. If you 'ave rugs you 'ave money. Sa'ib, money is not'ing between you an' me. Tell me your price an' take it 'ome. Eighty-five rupea? Sa'ib, it worth t'ree 'undered! If you take it an' sell New York, London, Paris—then for five 'undered, a t'ousand rupea! An officer sa'ib bid me four 'undered yes'day an' I ref-fuse. I want *my* memsa'ib to 'ave it.

" Still only eighty-five? Sister, do you not know it is a *good* rug? Not like those unclean rubbish Daoud or Achmet show you. *This* came Mosque of Ardebil. See, sa'ib, the stitch. Scratch it! T'ree 'undered to inch. It is a rug to 'ang up. 'Ow much? Still only eighty-five? Sa'ib, it break my heart, but you are my fren'. Take it. Eighty-five, Sa'ib, an' a leetle five for me."

Both dealer and customer part contented with the bargain, the dealer with a profit of Rs35 on a rug bought from a needy Persian pilgrim, and the memsahib happy in the possession of a really lovely little Caucasian.

It is always safe to buy a good Hamadan camel-haired runner. Somehow these are never made by the cheap factories in Persia, turning out rugs by mass production. Bokharas, the true old Bokharas, are always irresistible with their exquisite shades of purple and rose, black, cream and blue, and their beautiful bloom of a perfectly ripe plum. Lovely things they are indeed, supple and soft,

but, oh! to think of the tiny fingers nerveless from working all day weaving at the loom, and of tiny limbs too crippled to stand after sitting for eight hours on a wooden plank, tied on for steadiness! For it is the children of Persia who make the best weavers. Mites of eight or nine weave all day in a hot damp air, necessary to keep the wool pliable, but very bad for little lungs, putting in sometimes four hundred stitches to the square inch in the best rugs, as only such tiny fingers can. Poor, poor little old babies!

The goldsmiths' or silversmiths' bazaar, the Sûq or the *Sayyâgh,* is very disappointing for new work; the jeweller seems unable to design anything except nose-rings, hair-tabs for the ends of the Jewesses' pigtails, and bangles. They all show trays of imitation stuff from Birmingham or Berlin, vulgar but not cheap, but here and there, once a month if she is lucky, the collector will pounce delightedly on a precious old ewer or basin of embossed silver, a sugar-bowl or sherbert flagon brought down hidden in some cornsack from forbidden Persia. The huge anklets look enormously solid and valuable, but are simply rolled or washed gold on thin beaten silver. Old Jewesses still wear their anklets next to the skin with terribly bright salmon-pink silk stockings stretched to bursting-point over them, their feet thrust into soft heelless slippers. The younger ones wear them over their silk stockings, above the most extravagant Paris heels and shoes of decorated patent leather.

Plumpness is esteemed a great beauty among them, and the mem-sahib's pity over the heavy Jewesses staggering along in their tight shoes on uneven ground is quite thrown away. It all suggests money, which is the effect aimed at, and they are, of course, only worn in the street.

The Shoe Bazaar has dozens of little khans, each with strings of rose-coloured leather shoes clustering like vines about it, fragrant as only Persian or Russian leathers can be. The Saddlers' Sûq has many a trap for the unwary. The lighting is poor, and piles of high Moorish saddles, with their large embroidered and painted flaps, are strewn about the ground. Bridles, girths, and quirts are bunched about the walls, everything decorated with blue beads and cowries to ward off "the Eye," which every Eastern dreads as much as he does Shaitan. The chief saddlers show the enormous headgear, all tassels and knots of blue, orange, red and yellow wool, that the stud bulls of the camel herds wear in their pride of sex, with the coils of multi-coloured ropes to match that are tied about their tails.

Shrill whirring of a hundred sewing machines working at once greets you in the Street of the Tailors, one of the least crowded in the whole congeries of the sûq, as it always seems the busiest. The Street of the Potters in the Shorgi Bazaar is delightfully cool. Every

khan sells the same bowls, water-pots and jars, and all are glazed with greens and blues in those exquisite shades we call " Persian," but the Persians themselves call " the colour of love." The Arab is entirely without feeling for beauty or art of any kind, except music and dancing. Everything artistic comes down from Persia. Even the tiles of the mosques when they need repairing are sent up by caravan to Teheran. And so in the bazaars everything that appeals by charm of colour or design has come south from that country that gave the world its first artists thousands of years before Egypt drew her first vague outlines in charcoal—from Persia.

The Joinery Sûq, where the clumsy, wooden Arab couches are made, and the low native tables—for here the level of the table is below that of the seat—is very dull and empty. The only buyers are natives, so there is little money to be made. Everyone passes through it, however, for it is the nearest way to the most wonderful and bewildering sûq of them all, the Street of the Coppersmiths.

Down a long winding street roofed in, as so many are nowadays, with petrol tins beaten out flat, the coppersmiths work at their deafening craft. It is not credible to an Anglo-Saxon that a man should endure the din for a year, much less a life-time. An Arab coppersmith's ears must be dulled by heredity, for you see grandfather, son, and grandson hammering away placidly enough, all busy on the same jobs. Every kind of copper utensil is made here. Huge beaten trays five feet across, with an edge crinkled like a patty pan, to put under brazier or oil-lamp. Enormous waterpots, still made as the first one happened. Rebekkah jars large and small, flowerpots, saucepans with their curious ribbed lids with a large knob atop, deep stewpans and frypans, delicate ewers and basins, beakers and flagons, the characteristic door-knockers of the city—a solid hanging crescent holding a star—nothing is too small or too big for these coppersmiths to beat out.

The many braziers at work produce a bluish haze through which the copper gleams delightfully. Countless rays of blinding sunlight pierce the tin roof and cross the high blue darkness with long fingers of light, as if a hundred searchlights were pouring down from hovering aircraft. The din is unbelievable with more than two hundred coppersmiths hammering away. It is worse, much worse, than a dozen riveters busy at once on the steel sides of a liner. No megaphone could carry through it, all attempts at conversation die away in helpless laughter, as the noise seizes and stupefies. The sun's rays dazzle in their scorching strength, so that the copper pots spread out over the footway become so many traps to the unwary. Charcoal gleams red in the hundred tiny braziers, where the youngest member of each family seems to be always brewing fresh *chai*. In the dim,

heated darkness below the overhead cross-cross of rays surge a crowd of Kurds, Persian coolies, town Arabs, and rare Bedouins, clean or malodorous. Black-coated Arab women pad past with a tiny tinkle of silver ornaments. Silk-swathed Jewesses waddle along, the glorious colours of their ubi lost except where an overhead ray blazes one into sudden fire of emerald or flame.

In spite of the fact that your throat soon aches with the noise, that eyes are blinded with the overhead dazzle, that the stench of the unwashed press round about is doubled by the heat from the braziers, a saunter through the Street of the Coppersmiths in search of treasure is an experience you return to again and again, and never draw blank.

The Dyers' Sûq is a blessed relief after the din of the coppersmiths. The tiny clean khans are hung with long hanks and spools of beautiful silks. All raw silks come down in the caravan from Persia and are dyed in Baghdad. A dyer keeps all combinations of tones in his head. Some know as many as three hundred shades of red or blue! If you wash over an unusual colour on paper or take an odd scrap of material to the dyer, he will wash and dry a score of different dyeings until he gets it just right for you. In many of these tiny quiet khans you will find men busy at their small handlooms, weaving the wide silk belts with the multiple tiny patterns so beloved of the wealthy Arab. An inch or so is a long day's work, for the thread is fine and every colour is used. They are quite expensive, but last a life-time. Curiously enough, these belts are rarely bought by the bargain-hunter. Other men sit embroidering the brown camel-wove robes which so many Arabs wear, stitching a strip of gold-thread pattern about the neck. They make an embroidery frame of their knees, wrapping the garments tightly round and under.

And everywhere the Jew runners sit on their low stools, throwing a handful of nickel tokens from hand to hand, with an endless metallic rattle, their sharp eyes weighing your financial status to a rupee as you pass. Everywhere they insinuate their clever, annoying personalities between buyer and dealer, raking a commission off each, an unwanted third allowed by tradition and so untouchable, though detested by all.

GREECE

(*Continued from Volume I, Number* 1, *page* 168.)

The Greek characteristic of individualism, which results in their failure to follow their leaders, was exemplified in the case of Capodistria. After holding office for only three years he was murdered.

Next the Greeks tried to obtain a foreign King. They offered the crown, amongst other people, to an Englishman, namely, Lord Stanley. Eventually, in 1832, Prince Otto of Bavaria accepted the throne. He duly arrived in Greece with a considerable Bavarian entourage, included in which was the royal brewer, under whose name most of the Greek beer is still concocted. But these Bavarians were not sufficiently acquainted with the Greek character to realize that the despotic type of government to which they were accustomed would never be tolerated. There is no doubt that Otto was a conscientious man, yet his rule became so unpopular that after thirty years he was deposed by one of those military revolts which, as will be seen, became frequent later on. During his reign the capital was transferred from Nauplia to Athens, where it was at one time proposed to build a royal residence on the top of the Acropolis. Fortunately, on another site being selected, the æsthetic disaster of a nineteenth century German palace standing alongside the perfectly proportioned Parthenon was averted.

There now followed as King of Greece, Prince George of Schleswig-Holstein. He came to the throne under good auspices in 1863, for Great Britain took the opportunity of transferring Corfu and the Ionian Islands to Greece. Like Otto, he was a conscientious man; and like others before and after him, he found that to be a Greek ruler is no easy matter. Not only in Greece itself, but in neighbouring territories where Greeks lived, the legitimate wish for a greater Greece became strong. As Cretans are inclined to be a pugnacious people, the wish first found expression in risings there, whilst elsewhere the country became generally disturbed. There followed a deterioration in the financiai situation, and when this was accentuated by an expensive mobilization, a policy of loans was begun which has continued ever since.

In 1896 the Cretan question came to a head. It is worth examining this business, because out of it arose Venizelos. Also it is to be feared that the subsequent disagreements between him and the Royal family had their beginnings in Crete. It will be remembered that the Powers intervened between the Greeks and Turks in Crete and our Mediter-

ranean Fleet went to Candia. The result was that Crete was granted autonomous government, nominally under Turkey, with Prince George of Greece as High Commissioner. Now it happened that Venizelos was one of the leading politicians of Crete, and it is believed that he and the Royal High Commissioner did not always see eye to eye.

Encouraged by the Cretans having—almost—thrown off the Turkish rule, those who (quite rightly) thought that Greece should expand into Macedonia forced their demands to such an extent that there was war with Turkey. The complete defeat of Greece, which followed, showed that she was not ready yet to tackle Turkey. She had to pay an indemnity, thus necessitating further loans. At this time an International Commission of Financial Control, which still remains, was established, so extensive was the borrowing. Questions arising out of the payment of interest on loans have been, and sometimes are, causes of dispute between Greece and England, and other powers. In 1847 we had to send warships to enforce payment for loans made during the War of Independence. At a later date our Fleet blockaded the Piræus whilst we received satisfaction for the exaggerated claims of a Portuguese Jew, called Don Pacifico, who somehow was a British subject, and whose house at Athens had been damaged in a riot. Although this incident has been quoted as a fine example of how Britain backs up her subjects overseas, one cannot help thinking that our diplomatic representation must have been rather weak to have needed so forceful a backing. In the end it was found that quite a small payment recompensed the injured party. During the Crimean War another blockade of the Piræus became necessary, because Greece tried to take advantage of the pre-occupation of our ally Turkey, and get more territory. Thus during the childhood of modern Greece, England played the part of a not-too-indulgent elder brother.

Let us now return to the situation in Greece, where, after the disastrous war of 1897, a complex position was surrounding the Government. In spite of the recent defeat, the desire of Crete to become part of Greece, and of Greece to expand into Macedonia, became ever stronger. The Army and the Navy were interfering more and more in politics, especially the former, which had organized a Military League. Money, as always, was scarce. In the middle of all this the Prime Minister, Delyannes, was assassinated. So the King called the National Assembly to decide what to do.

Out of this confusion there rose up Venizelos. Under his tutelage modern Greece came to manhood. He seems to be the only man that can manage Greece, and like Ulysses before him, no one else is able to pull the bow. His first rise to power was somewhat dramatic. He had been got over from Crete to act as political adviser to the Military League, to which reference has already been made. He obtained a

seat in the National Assembly which the King had just summoned, yet by his influence this same Military League was done away with. On his becoming Prime Minister soon afterwards, he proceeded to reorganize and strengthen the constitution. In fact, he seems to have resembled Cromwell in that he was put into power by the Army; but he consolidated his position by dissolving the Military League, whereas Cromwell dissolved the Parliament.

In foreign politics he aimed at, and achieved, the expansion of Greece by making war on Turkey. Realizing, however, that Greece could not do this alone, he formed the Balkan League. Whilst this was being organized British and French Missions were used to train the Navy and Army. The result was that when peace was made after the successful Balkan Wars of 1912-13, Greece obtained practically all she wanted. Her new northern frontier included Janina and Salonica; Turkey ceded most of the Aegean Islands; and Crete was annexed. In these wars the innate patriotism of the Greeks was once more in evidence, for thousands of them returned voluntarily from overseas—from India, America, and so on—to fight in the crisis.

Of course the Greeks have been strongly criticized by the opponents of Germany for the part they played, or did not play, in the war of 1914-18. Yet the difficulty in which the Greeks were placed is not, perhaps, generally understood. They certainly had a treaty with Servia, by which they were pledged to help her if she was attacked. But the question was, did this treaty, when it was made, refer only to a Balkan war? Or was it meant to apply to a general European war as well? King Constantine, with his German Queen, and their followers, held that this treaty did not apply to a European war. Venizelos and his followers held the contrary view; and in any case, they said, it was to the interest of Greece to fight on the side of the Entente. To begin with, whilst Venizelos remained Prime Minister and his influence was still strong, two definite offers of Greek assistance appear to have been made. Soon after the outbreak of war, they proposed to come to the help of Serbia, provided that several divisions could be put into Greece as a safeguard against Bulgaria. Later, when the Dardanelles project was developing, they made another offer. Unfortunately, neither of these offers could be accepted. As regards the first one, at that time we could spare no divisions for Greece or anywhere else. As regards the Dardanelles, the Greek assistance is believed to have been contingent upon the landing being made at Bulair—which was strategically incorrect—and also upon King Constantine being Commander-in-Chief, which was unacceptable to Russia, both Greeks and Russians being covetous of Constantinople. Moreover, it seems probable that we were not able to offer many inducements to Greece, because we were then in the process of offering a good many to Italy.

The divergence between the followers of Constantine and the Venizelists widened almost to civil war. Though this did not actually occur, there was a movement of pre-Entente Greeks to Salonica, where several thousands eventually concentrated. They did this in defiance of the existing Government, and at considerable risk to their lives and property. This was a fine action, though one which is not always appreciated. Having definitely fallen out with the King, Venizelos himself joined this concentration. In conjunction with Admiral Conduriotis, the existing President,* and a General called Dankles, he directed the affairs of the pro-Entente Greeks; so that there existed two governments—King Constantine at Athens and the Triumvriate at Salonica. After some delay the Allied Powers recognized officially the Venizelists at Salonica, and supplied them with arms and equipment.

In the meanwhile there were curious happenings in Athens, where the representatives of the Entente and of the Central Powers were each striving for Greek adherence. At this juncture, as a sort of guarantee for good behaviour, the Entente representatives appear to have demanded that a large number of rifles should be delivered up, and marines were landed to enforce the demand. Regarded in the light of later years, it seems rather a stupid—if not a bullying—demand. As a material guarantee the rifles were of little value; whereas it might have been expected that the demand would cause exasperation, which it did. In this unfortunate episode the Royalist troops fired on the marines, causing them considerable loss, and it is believed that the officer in command suffered some loss of dignity.

After this, the pro-German party got the upper hand for a time, and our diplomatic representatives and also our nationals were withdrawn. Later on, really effective pressure was brought to bear—amongst other things the Fleet once more established a blockade. Eventually Constantine abdicated, his son Alexander reigned in his stead with Venizelos as Premier, and in June, 1917, Greece formally entered the war.

When treaty-making began, Venizelos represented his country with consummate success. By the Treaty of Sèvres he gained for Greece a great deal of Thrace and a mandate for Asia Minor. Accordingly, at the request of the Supreme Council at Paris, Greek troops landed at Smyrna in May, 1919. Yet when Venizelos returned to Greece, after a long absence, he had lost his hold and fortune went against him. King Alexander had died, his brother had refused the crown; consequently the only claimant was Constantine, the old opponent. They held a General Election, at which the issue really was whether there should be a Republic directed by Venizelos or a Monarchy under

* Admiral Conduriotis has resigned the position of President since this article was written.

Constantine. And to the surprise and consternation of the Allied Powers, Venizelos was completely defeated.

It will be remembered that by this time the unforeseen power of the Turkish Nationalists, under Mustapha Kemal, had to be seriously reckoned with. Presumably with the double object of propitiating Kemal and of hindering Constantine, a revision of the Treaty of Sèvres was proposed and our financial support of the Greeks was withdrawn. This double-shuffle does not seem to have achieved either object. Kemal's hostility in no way decreased, whilst Constantine—with that Grecian impetuosity that has been already noted—refused to consider the revision of the Treaty and launched the Asia Minor offensive. The further mistake was made of replacing many of the Venizelist officers holding high rank in the Army by Royalists, with the result that many important posts came to be filled by men lacking war experience.

The disaster at Smyrna in 1922, and the evacuation of Asia Minor is, of course, well known. Yet it may be of interest to see what were the repercussions of this catastrophe in Greece. Here was a country which had existed as a modern state only for a century; for the last fifteen years of that period it had been at war; it was bankrupt; the Army was defeated and deserting; a population of five millions was called upon to absorb a million and a quarter refugees. Such a cataclysm would have caused a revolution in many long-established states with greater resources. It was bound to do so in Greece. A number of military leaders set up a dictatorship which threw the Government out. Constantine abdicated and eight of his Ministers were shot.

The soldiers, having established a reasonable degree of order, handed over the job of government to the civilians. But the politics of the next few years were very confused. At one time there was a Regency, at one time King George reigned, and from 1926 General Pangalos ruled for a year as Dictator. Venizelos, in the meantime, though it is believed he had vowed to have no more to do with Greek politics, had agreed to conduct the negotiations for peace with Turkey. This was settled at Lausanne in July, 1923. Under this treaty Greece adopted her present boundaries. It is appropriate to observe that the islands of Imbros and Tenedos, off the Dardanelles, went back to Turkey, and that no armaments are permitted on several Greek islands in the eastern Aegean.

Military intervention again rang down the curtain, this time on the opera-bouffe Government of General Pangalos. After order had been restored in Athens, following the street fighting that accompanied the revolution, the soldiers gave the reins to a Republican Government representing all parties.

This Coalition Government was faced with a task which amounted to no less than the constitution of a Republic where once had been a

Monarchy, and the reconstruction of a country which years of war and revolution had reduced almost to chaos. To be more definite, one can enumerate some of the business required: a constitution had to be framed; an Upper House—equivalent to our House of Lords—must be made; the Navy and Army needed reorganization; the fluctuations of the drachma must be stopped. What was to be the foreign Policy? Could money be found for urgently needed roads and reclamation of land for agriculture? How was the settlement of refugees progressing?—all these were pressing questions.

At first the new Government made reasonably good progress. Leaders of all parties seemed to see the necessity of co-operating to get things done; whilst the man in the street was as sick of politics as a Greek can ever be. Notable achievements were the stabilization of the drachma, the formulation of a foreign policy, and the reorganization of the fighting services. It would seem that the Greeks intend that their foreign policy should be as much under the auspices of the League of Nations as possible. They referred the Italian filibustering at Corfu, in August, 1923, to the League, and are considered to have handled a difficult matter very well. Before the Great War, as already explained, their policy aimed at alliance with certain Balkan States against others; now they wish to be equally friendly with all neighbours. To this general statement the writer, without claiming any special knowledge, believes that two provisos should be added. One is that Greece does not intend to concede to Servia, or any other country, more concessions at Salonica than the free-zone already provides; to do so might be the admission of the thin edge of the wedge. The other proviso is that, remembering the dilemma produced in 1914 by the Servian Treaty, Greece will not enter into any engagement which could possibly involve her in the quarrels of greater states.

The Government followed the policy of its predecessors both before and after the Great War, by employing British and French Missions for the training of the Navy and Army respectively. The state of the Services at this time was really extraordinary. During the past years each Government to come into power had filled the important posts with officers adhering to it, and had thrown out any who did not. Consequently many officers had been unemployed, abroad, or possibly in confinement, for a considerable time. But the policy of the new Government—being a coalition—was, quite rightly, to get all officers back to work again, whatever their politics. So there were amongst the officers many who had served very little for several years, who were often on bad terms with each other, and in the senior ranks particularly were lacking in experience. At the same time a number of extremely keen young officers were recently returned from training courses in England or France, and they were sometimes—quite natu-

rally—dissatisfied with what they found. Nevertheless, the keenness in the Navy, of which the writer had experience, was remarkable. Criticism is of course easy, but it must be borne in mind that the disadvantages under which the Greek Navy and Army work are great. Both are conscript services, and illiteracy in the ranks is not rare. Again, for reasons of economy, very few ships remained fully manned throughout the year. Also shortage of such supplies as oil fuel, petrol for aeroplanes, ammunition, paint, or even soap, interferes with training in a manner which has to be experienced to be believed. Another handicap, now that warfare is becoming more mechanized, is that the strong strain of oriental in the Greek makes him a very bad mechanic. Yet in spite of all disadvantages, and by no means all have been stated, steady progress is made, due—in the writer's opinion—to keenness which is inspired by the characteristic patriotism. It may be added that sons of the best families in Greece enter the Services—particularly the Navy. The President is an Admiral, and proud of it, whilst his son is serving as a Commander.

The settlement of the one and a quarter million refugees, mostly from Turkey, has been organized by a mixed British, United States of America, and Greek Commission. It is financed largely in America, by loans, and works under the aegis of the League of Nations. The magnitude of this work can be judged by the fact that special towns have been built for these people, and agriculture has been specially developed to provide them with employment. The work of the Commission, which has been really successful, is now nearly finished. The interest on the loans will remain for Greece to pay.

After a while the efforts of the Coalition Government began to wane. Or perhaps it would be fairer to say that owing to its inherent weakness—for the party leaders were not really in agreement—such a Government could not be expected to achieve all that was required. Things began to hang fire. For instance, roads are everywhere most urgently required, yet the negotiations with contractors for their construction reached no conclusion. Though they had framed the constitution, the making of the Upper House seemed as far off as ever. There were difficulties in the police, and brigandage began again in country districts. With all this there was a spirit of unrest. There were rumours of a military *coup d'état*, or of another Pangalist Dictatorship.

At this juncture, in the summer of 1928, Venizelos forsook his supposed vow never to enter politics again, and returned to Greece. As was to be expected, political opinion was sharply divided. His supporters said that the situation required a strong hand, which it certainly did, and that only Venizelos could deal with it. His opponents argued that by stirring up the old hatreds and probing the old wounds his return must, anyhow, do more harm than good. At

the General Elections held in August, 1928, the issue was really a vote of confidence in Venizelos as Prime Minister, and he was overwhelmingly successful.

So far, his return seems to have been amply justified by results. Many of the outstanding questions were quickly decided, the Upper House has been formed, and the President—who is an old man without personal ambition—has patriotically entered on a further term of office.

Speaking generally, therefore, it would appear that the position of Greece is more stable now than for a very long time. Though Great Britain favours no political party in Greece more than another, we do want stability. Of course the Great War must have altered our views as to the importance of Balkan matters a good deal. Nowadays they are not so potential. Yet it would be an exaggeration to agree with Bismarck, that "the whole Balkans are not worth the bones of one Pomeranian grenadier," because our interests in Greece are considerable. There exists a good deal of Anglo-Greek business, we have capital in Greek loans, our Mediterranean Fleet is allowed free use of Greek anchorages, and the England to India air route calls at Athens. To these material interests one may fairly add that England has been, by sympathy and tradition, the friend of Greece for over a century.

It is extremely difficult to make any predictions as to the future of Greece. What she needs is peace, with a strong government in power. Will she be allowed to have it, or allow herself to have it? Despite the very real safety precautions of the League of Nations Covenant, the Balkans and Turkey remain an inflammable area. Most of these nations are rivals, whilst Turks and Greeks still hate each other. At the same time the Greeks are an ambitious, imaginative people, who remember that Greece has twice been a great power, and has had Constantinople as her capital.

A good deal seems to depend on finance. Greece has no great resources. She is an agricultural country, deriving most of her wealth from the export of wine, raisins, olives and tobacco. As nearly all the agricultural land is already cultivated there cannot be much increase in that direction. Neither do minerals exist to enable her to become an industrial nation. Against this may be offset her expenses, which are considerable. The interest on many loans has to be paid; the whole country is backward and needs to have money spent on roads, drainage, education; and there are armaments.

Much also seems to depend on how long Venizelos can continue in office. It is difficult to discern a possible successor amongst the public men of Athens to-day, for the ability to lead Greeks is a gift which few possess.

Yet, notwithstanding the uncertainties of the future and the difficulties of the past, Greece is apparently more stable now than for many years.

AN AIR TOUR IN INDIA

By Flight-Lieut. J. Kingston-McCloughry, D.S.O., D.F.C., *p.s.a.*, R.A.F.

It was a crisp and glorious sunny morning; I had just returned from a morning ride round Jakko, the monkey-infested landmark so well known to all who have visited the centre of Indian society, and on entering the Club veranda for breakfast was greeted by an old Army Colonel with the remark, "Well, my boy, this is your last morning of comfort for some time; anyone who chooses to visit the North West Frontier in July is bereft of reason."

That evening I took the rail motor down the Khud, leaving Simla and the 7,000-foot spur of the Himalayas behind. Sunset was soon upon us, and as we rattled down the mountain side the myriad lights of Simla could be seen gradually ascending and twinkling as stars in the heavens. A four-hour journey with half an hour's halt at Barog for an excellent dinner brought us to Kalka, the terminus of the mountain rail, and as the motor came to a standstill a whiff of tropical air reminded us that we had reached the plains. After months of living high in the clouds we now appeared scarcely able to breathe. After another journey by rail we reached Lahore, where I was to collect an aeroplane for the tour. Here my bearer, a necessary appendage to travellers in India, left me and went north by rail.

The following day dawned with a thick dust haze, not at all pleasant flying weather, but since such haze is by no means abnormal during July I decided to make a start. Luggage is a difficult problem for air travellers in a country where bedding has to be carried for oneself and a mechanic, to say nothing of mess kit, evening dress, dinner jacket, tennis clothes, tennis racket and sundry other oddments. We had two valises, three suit-cases, engine tools and spares, all of which were hung in carriers under each of the lower main planes. Our clothes whilst flying consisted of khaki shorts and shirt, a spine pad and flying helmet; even at a height of 10,000 feet no more was required.

On taking off we climbed to 2,000 feet and then flew over Lahore, where, through the haze, could be made out the ancient city of Mogul days and the present capital of the Punjab. Speeding away from the Sutlej, the southern of the five great rivers of the Punjab, and leaving behind Lahore, one of the hottest places in India during the summer,

we passed over the Ravi River and headed north. The visibility now improved a little, but was still under a mile; yet little was missed, for we were now passing over vast stretches of treeless and uninteresting country. After an hour's flying we reached Wazirabad and the Chenab River, and then, after thirty minutes over country closely irrigated by canals and wells, we crossed the Jhelum. Flying low, we could distinguish Magar lazing on the banks. The arid plains gradually gave place to rocks, and at last Rawalpindi loomed up. Surrounded by a chain of forts, this town is the key to the British system of defence upon the North West Frontier; railways radiate from it; here also the roads into Kashmir begin. The haze which had persisted now began to lift, the sun broke through and the visibility lengthened, but Old Man Sol brought his heat with him. Our "swigs" at the water-bottle increased as perspiration flowed more and more freely.

After leaving "Pindi," we skirted the mountainous Kashmir, passing over valleys bordered with grim rocky hills, we suddenly came upon flat open country again. Soon a dark contour ahead rapidly defined itself as a large river, the Indus, with its wide eroded channel—the last of the five great Punjab rivers. Looking down to the left, one can see Attock bridge, where the military and trade routes from India into Afghanistan have for centuries crossed the Indus. One's mind goes back to the days of Alexander the Great, for this was where he crossed in his invasion of India. One's emotions are likewise stirred by the rocky gorge through which the Indus flows, with its distant view of the Hindu Kush; some of the finest scenery in the world.

Leaving the Indus, we followed the Kabul River, passing over Nowshera with Risalpur aerodrome to starboard, and then over the highly fertile valley of Peshawar. Twenty minutes later Peshawar city appeared, encompassed within a horseshoe mountain barrier which towered ahead and to the flanks. We circled round the cantonment and then glided down to the aerodrome, and although the journey had been hot, the intensity of heat was suddenly increased by a fiery blast which heralded the temperature on the ground. Getting out of the aeroplane, I found my meagre clothing soaked with perspiration as though I had come out of a tub. A drink, a bathe in the squadron pool, lunch, and then I slept through the afternoon under a punka. Europeans seldom appear in the afternoon until five or six o'clock, when a game of golf or tennis is played, followed by a visit to the Club. The Club is the rendezvous for Peshawar people during the hour or two before dinner, which is at nine o'clock or thereabouts. At the Club one sits on the lawn under a large fan, imbibing one's favourite drink, always accompanied by steady perspiration. The only

ladies left in the cantonment at this time of the year are a few hospital sisters; the rest have fled to the hills and the luxury of a cooler climate. Peshawar is the capital of the North West Frontier Province, and is only 11 miles from Jamrud, the entrance to the Khyber Pass. The natives are chiefly Pathans, with a sprinkling of Hindu shopkeepers; they live in a huddle of flat-roofed houses built of mud, and crowded along narrow, crooked alleys. Here for many centuries the Afghan merchants have brought their caravans each autumn. Passing through the city, it is difficult to believe that little more than 100 years ago the place was a favourite residence of the Afghan dynasty and the capital of Afghanistan.

There are few more impressive scenes than that enjoyed by standing on the golf links of Peshawar and watching the sun set in his red splendour over the towering mountain barrier which divides India from Afghanistan. I watched the sun's disc sink gradually behind the silhouetted range in the cool and quiet of the evening. The stillness was broken only by trumpet calls which brought visions of wars of bygone days. People stationed on this plain may weary of the scene through surfeit, but there is no doubt that such pictures create the fascination of the East.

During my stay I motored up the Khyber Pass, a narrow winding defile and one of the most important historical gateways in the world. Through here passed and repassed the Macedonians under Alexander the Great, the Greeks, Tartars and the Moguls on their errands of loot and conquest. From Peshawar one first passes along a barren stony plain, whilst in the distance stretches the great central range of the Safed Koh, which with its rugged peaks forms the southern wall of the Kabul River. At Jamrud, forts begin to appear on either side of the road, and this area is infested by some of the worst cut-throats of the country. The mountains are entered at the opening of Shadi Bagian, and then Khyber proper begins. The road, with the railway alongside, winds and climbs through rock flanked by steep cliffs on either side—a lasting memorial of engineering triumphs. Landi Kotal closes the other end of the Pass. From here one looks down upon the plains of Afghanistan and sees the Khyber debouching on to the Kabul River. It is indeed the scene of many skirmishes and wars; here it was that disaster befell our British troops. Proceeding on from Landi Kotal, the rough winding road descends quickly to our frontier cantonment at Landi Khana. Suddenly one is confronted by a gateway blocking the road; this is the Frontier gate of India, beyond which few may now travel with safety.

My next place of visit was Kohat. From Peshawar we flew due south, over flat but rough country, until we reached the southern side of the horseshoe barrier. Here we headed for the Kohat mountain

pass, some 3,000 feet above sea level, and after a few minutes flying over unpleasant country, Kohat cantonment and the aerodrome suddenly appeared stretching out ahead. We were now in the heart of the Afridi country, and at the starting-point of the Tirah campaign of 1897. It was in this cantonment, only a few years ago, that a British subject was murdered and a girl carried away to the hills by a party of raiders. The cantonment is still surrounded by barbed wire entanglements and closed at sunset.

From Kohat we flew to Arawali, one of our outpost landing grounds on the Afghan frontier. Flying along river valleys and ravines and over deeply scored rock, we reached Thal after one hour, and then turned north up the Kurram valley. After winding for twenty minutes along this valley where Roberts advanced to Kabul during the second Afghan War, we found ourselves above the large elevated expanse of Arawali landing ground. Here we landed, for a cigarette, amidst the tribal countries of the Tirah and the Zurmat, where the inhabitants maintain their independence in the rugged hills which flank Afghanistan; it is striking that our great civilized power has obtained so little influence over these semi-savage tribes only five minutes from our base.

From Kohat to Miranshah is one hour and fifty minutes' flight. During this journey the country passed over consists of a series of parallel folded flexures containing some of the greatest veins of solid rock salt in the world. One cannot but marvel that not only the country below, but also the whole of the Himalayas were once under the sea. The crumpled earth, which has been folded and refolded, must have been thrust up in some most violent fashion which one would hesitate to attempt to explain. Miranshah, standing alone on an open space encircled by mountains and lofty peaks, is a fortress of bygone-days' design. The Political Agent, the Tochi Scouts and the R.A.F. all live self-contained within high mud walls which are surrounded by barbed-wire entanglements and guarded by sentries. Although the landing ground is adjacent, the aircraft are kept within the walls. The surrounding country is so barren and stripped of life that the sentries posted at every entrance and within sight of each other round the high walls, create a fairy story atmosphere; but experience has proved the need. The gates are closed at sunset, after which no one is allowed to pass, and any sound or movement has a searchlight beam turned quickly in its direction. By day, when one ventures far afield, an armed escort is required.

I rose early next day and was ready to be off at daybreak, but with the coming of the light that thick dust haze, which often drifts up from the plains, could be seen. My trip was off, and I was at first disappointed to be marooned in such a place, but I was soon to find that Miranshah grows upon one and a jollier crowd of fellows, than the

garrison there, one could seldom hope to find. One officer was still celebrating a lucky draw in the Calcutta Sweep, my first meeting with one of these mythical people. For three days I remained there and thoroughly enjoyed every minute. There is a tennis court and clock-golf lawn within the walls, and once we motored out to the Tochi River and spent the evening fishing, with armed escorts by our sides. On our way back we passed through a fusillade of stones thrown by way-side children, but such courtesies, I was told, are common.

Being so confined, the view is apt to become a little monotonous, and everyone certainly knows the movements of all life within the fort. Whilst we were lazing on the lawn, listening to a gramophone which was kept going by a chokra, two ducks passed and someone remarked, "Where is the other? Duck for dinner to-night, chaps." He was right.

It was here that Aircraftman Shaw was stationed for so long. I was told that he loved the place and was grieved to go. He left to his associates, and those to follow, a library of choice books and a handsome gramophone and records, all gifts to himself from Bernard Shaw.

Waziristan lay in my path to Quetta. It is an hour's flight over this section of the mountain tract which lies between the Tochi River on the north and the Gomal on the south. This country, a labyrinth of mountain ranges, with peaks scaling 12,000 feet or more, is perhaps the most lawless country in the world; the ground is brown, barren and sun-scorched. A cough of the engine, a forced landing, and there would be little hope of survival. Even if not killed, one would have to run the gauntlet of the Mahsud and Waziri races of robbers and murderers. It is interesting to know that this wild country, that which Lord Curzon gave up all attempt to subdue, is now to a great extent controlled by air power. The Wana patrol, known to the local pilots as the "flight round the world" (and, indeed, there are as many risks), is carried out every fortnight. In this patrol a flight of aircraft fly round Waziristan to "show the flag," and, incidentally, they come low over the control centres to count the Khassadors who stand in the open and wave their arms as proof of their continued allegiance; it is upon the air report of these numbers that their pay rolls are based.

Accompanied by another aeroplane as escort, we flew on a compass course over tortuous eroded precipices and deep gorges, over stupendous mountains which mass themselves in intricate series, some capped with cloud, with not a landmark to follow until we sighted Kajuri Kach, a large mud flat and the junction of the Zhob and Gomal Rivers. Here at last was a landmark by which I could orient myself.

From the Kach we steered south, passed into Baluchistan and followed the deep, steep-sided, winding gorge of the Zhob, the shortest

link between the North West Frontier Province and our military forces in the Quetta area. It is less than 50 years since the first European passed this way, which is divided from the plains by the Suliman range, and since then it has been the scene of many a punitive expedition. The ever-restless Pathan tribes of the Suliman Hills are now held in check by our occupation of the Zhob valley. Another 50 minutes' flying and we reached Fort Sandeman, with the famous Takht-I-Suliman (Solomon's Throne) in the background. Here we landed, and the altimeter showed 4,650 feet above sea-level. After refuelling and a hurried cup of coffee we set off again for Quetta, to do our last lap on the outward journey.

Soon after leaving Sandeman the Zhob valley widens out to form a barren desert-like stretch some 20 miles wide. This wind-swept valley is bordered on either side by rising ground as far as the eye can see. In these hills numerous confluent streams rise and flow into the Zhob, and as we flew west we noticed that the river diminished and the tributary streams increased until the former disappeared altogether near Ziarat. Hindubagh was soon overtaken and left behind, and half an hour later the peaks of Takatu and Zarghun, followed by the square-headed Murdar, loomed up ahead. Skirting round the former, we immediately sighted Quetta, our place of refuge for the next few days. The aerodrome here is 5,500 feet above sea-level, the highest in India.

Quetta, the southernmost point in the line of our Frontier posts, is one of the most important military stations in India; it safeguards the Frontier down to the Arabian Sea and secures the wildest of the Baluch Hills; it is the second largest military centre in the whole Empire. From here the route out of Kandahar can be barred, and it is the trade mart for Western Afghanistan and much of Central Asia. The place is surrounded by rocky sterile hills, though there are abundant orchards scattered round the cantonment.

One day I flew to Chaman, an outpost standing alone on the very borders of Afghanistan. Taking off soon after eight o'clock, we passed round Baleli Point and then over the Mashelakh Hills. The morning was cold, with a wonderful visibility. Leaving the rock-scored country behind, we were soon speeding over flat desertlike ground. Ahead was a wall of mountains which appeared to stand up and block our path, but we were now at 8,000 feet and climbing steadily. The high ground was soon passing beneath us, and we could see the road and railway winding round and over the Khojak Pass. As we approached the peak of the Khojak barrier, Afghanistan, looking like a sea of red with islands of black rock rising up at irregular intervals, could be seen stretching far away to the horizon. This territory is really a land of sandy waste, completely barren and practically devoid of life. Chaman is right on the frontier, which can be

seen marked by white cairns a little ahead, and beyond which one may on no account fly. On landing, my passenger, a naval officer, gave a queer contrast to the surroundings as he stepped out on to Baluchistan soil in his nautical attire. A motor-car was awaiting us on the landing ground, and soon we were enjoying an excellent breakfast in the 7th Gurkhas' Mess.

I was held up at Quetta for a week, first by dust haze and then by torrential floods. Signals now began to arrive from headquarters for my return as soon as possible, so something had to be done. Sandeman, my first refuelling point, was still reported unserviceable owing to floods, but I resolved to make a start and set off at dawn next day.

We took off at half-past six in the morning and climbed to 9,000 feet, leaving a small margin over the highest ground in our path, then skirting the 11,500-feet peak of Takatu, we set a course for Hindubagh and thence along the Zhob valley towards Sandeman. The visibility was good and we could see on either side the long ridges of rough but picturesque highlands. The wide valley itself was flooded from end to end, for the rains had been torrential. On landing at Fort Sandeman the scars caused by the floods were obvious; deep nullahs crossed the landing ground and the Army troop lines were swamped. The discouraging weather report we had received at Quetta now began to show signs of fulfilment, for the clouds were quickly becoming lower. Following north up the Zhob gorge, we were forced lower and lower and at Kajuri Kach were almost down to the water's edge with a pitch-black cloud ahead. It was a race for the plains to the east. While we were winding eastwards at the bottom of the steeply scarp-faced gorge, the only opening through the Suliman Hills, it became blacker every minute and then lightning flashes appeared to port. Suddenly the steep sides of the gorge fell away and we debouched into the plains of Punjab. We had won the race, and climbing to 2,000 feet we could see the black monstrous cloud flashing and swirling behind.

I estimated that we could not reach the day's destination without refuelling, so steered east to Tank and dropped down for petrol. Alas, the stocks of fuel were kept at the cantonment some distance away, and would take an hour to get, so, after a sandwich and coffee, we sped northwards to Bannu. More rain greeted us, to be followed by brilliant sunshine. The same petrol difficulty was experienced at Bannu ground: seven miles from the stocks, and no transport. After an hour's wait a passing car gave a lift to my mechanic. A further two hours' delay in the blazing sun and we were on the way to Kohat. Thick haze obscured the Bannu plains, but presently this cleared and we quickly passed to hilly tracts intersected by narrow valleys. Then over salt-rock and a mass of twisted flexures, over wrinkled folds of some volcanic epoch, and Kohat, with the Jowakai Hills in the

distance, loomed up ahead. A few minutes later we landed for the night. After tea, we went down to the Club—incidentally denuded of the fair sex, with the exception of a devoted bride—for a game of tennis. Those who know Kohat will appreciate the amusement of such a game with "Old Man River."

We took off early next morning, with another gloomy weather report in my pocket. The clouds were already down to 500 feet when we passed along the Kohat-Khushalgarh railway. Presently the hills opened out and the harsh terraced hillsides gave way to rich plain lands; but a storm was brewing ahead, and very soon we were down to the tree tops. A bank of cloud reaching to the ground confronted us, and, turning back, we climbed above. Twenty minutes' flying, and a break in the clouds showed Rawalpindi below, and, as I did not like the weather, I decided to land upon the race-course. After an hour's wait the clouds lifted a little, though I suspected this was only a local improvement; nevertheless, I braced myself for a beastly journey, and off we set. Soon it became as black as night ahead, and in a short time we were ploughing into rain. Off with the goggles and down to the tree tops again, and picking up the Grand Trunk Road of Kipling fame, we pushed ahead. Looking below, I wondered which of the many rivers we passed was the "River of Life" for which Kim and the Lama spent their lives searching in vain. The land was flooded from end to end and had been so transformed from sunburnt plain into green pastures since our outward flight, that it was difficult to believe we were on the right course and over the same country. We skimmed over the Jhelum, Chenab and many other newly formed streams, with the weather getting worse, but there was nowhere to land, so on we sped. Suddenly, over Gujranwala, we burst out into brilliant sunshine, a contrast which baffles description. Climbing to 4,000 feet over the newly refreshed soil, the birthplace of Kim, with its mosques and temples, quickly grew out of a speck in the distance. On landing, we found the luggage, slung under the planes of the aeroplane, soaked by the rain through which we had passed. Our arrival was little too soon, for an hour later the heavens opened in earnest on to Lahore.

Our flight was now completed, and the same night we took train back to Simla. Whilst motoring to the railway station I saw fireflies for the first time: the legions of these insects darting to and fro like miniature comets gave a truly Eastern setting.

A night in the train brought me to Kalka soon after daybreak; clear and gloriously invigorating, it was one of those perfect mornings. After a two hours' climb up the winding mountain rail, passing through tunnel after tunnel, we arrived at Barog, where we halted for an excellent breakfast. Soon after leaving this place, as we curled

round the mountain sides, occasional glimpses could be seen of a cluster of buildings in the far distance, and, high above us, Simla. This small town, isolated on a spur of the Himalayas, is our terminus from which, for seven months in the year, the destiny of India and her millions of people is controlled. Two hours later we arrived to find Simla bathed in brilliant sunshine, the first it had enjoyed for nine whole days. A rickshaw ride through the narrow streets, and my tour was ended.

The Widest Alley in Underground Malta, photographed just before Noon.

DOWN THE MANDENAGGIO

EVERY year thousands of visitors spend a few days at Malta calling on the large English colony of Service people, both R.N. and R.A.F. They are enchanted with the odd quaint little streets and lovely bathing pools, but very few of them know of that most curious district called the Mandenaggio or "Underground Malta."

All who ferry over from the residential Sliema to Valetta for shopping, etc., pass up the Strada San Marco, that steep street known to all English residents by the self-revealing title of "Stink Street," on their way to the Strada Reale. Half-way up on the left is a low, dark, odd-looking arch with a shrine in its hollow. Under the arch a short flight of steps goes down, turns sharply at right angles blocked by a wall, and then continues downwards out of sight. This is the entrance to Underground Malta, but very few explore.

For years it has been forbidden ground to English residents. Even the Maltese themselves, other than the dwellers in this queer district, never go down unless accompanied by a police escort. Years ago every crime on the island was hatched in this warren, and to this day the dwellers below are a law unto themselves.

The Mandenaggio is quite small, only a square of roughly 200 square feet, yet it is one of the most densely populated spots in the whole world. Over three thousand souls live, move, and have their being in this tiny space.

In the time of the Knights of Malta, about four hundred years ago, the Mandenaggio was intended to be used as a dock where their galleys could be sheltered and repaired. After part of it was quarried and hollowed out, the stone was found to be too hard and unsuitable. The dock was abandoned, and in time high squalid houses of the type found in every poor Italian quarter was built up into a veritable warren. The dwellers have intermarried for generations, and regard all outside the colony as foreigners. The streets that bound the Mandenaggio do not in the least suggest the weird character of the labyrinth below.

Two friends and I were very anxious to see this curious corner, and persuaded a Maltese gentleman to escort us. He had been down once before, but brought a *dhaisa-man* (boatman) to guide us.

Down those dark steep steps we went, passing a bright blue shrine, well-kept, with scarlet ornaments and silver-painted candles, a vivid note of bright colours on the filthy walls. Our way led through alleys only four feet wide between the high houses, until at last we reached

the lowest part in an alley of blood-red walls lighted by a high shaft of sunlight. There was a wonderful effect of warmth and colour in the gloom and filth below. To see the sky we had to tilt our heads until we all got a crick in our necks.

In spite of the narrow space, coops of chicken were kept outside each dark doorway with its square hole above for whatever air there might be. Goats browsed freely on the garbage in the alleyways. They were the sole source of milk for the children, and were milked straight into the housewife's jug at her door.

Strong beams kept the leaning walls apart, though the air between is still further shut off from the ever-open windows by strings of washing from one home to another. As we went on, we came to a slightly wider place, perhaps eight feet across, where there was an ancient fountain. Women knelt on wet paving stones slapping their linen clean in the way of the South. Not only was washing done in public. A pastrycook had brought his table out in the alleyway, and was making cheesecakes, using milk from the tethered animal as he needed it. We watched, fascinated, and bought some when his little stove had baked them crisp. They were delicious, and we enjoyed them as long as we kept our thoughts from straying to the filth of that cook-place.

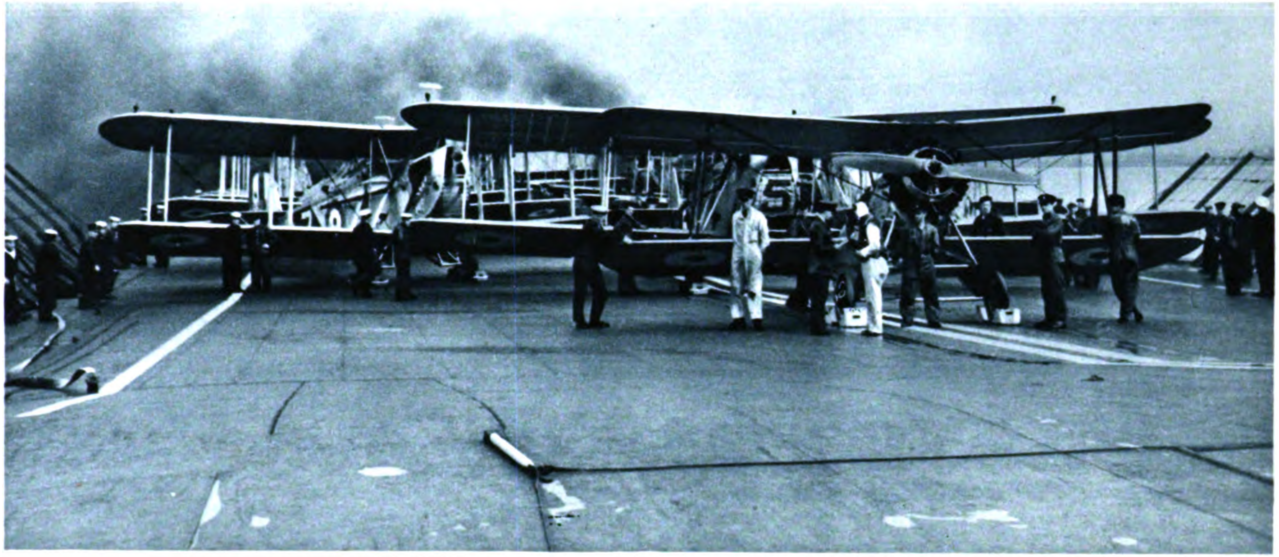
As every family seemed to live in a single room, the big evening meal was always cooked outside on queer square earthenware stoves in which they burn coal—alas, for the bunkers of H.M. Navy!—which was bought almost by the lump from a man trading with a single sack.

Sanitation was astonishing.

These dwellers in the dark were cheerful, loving gaiety and bright colour. They sang and gossiped across the bare yard of space as they did their house jobs in public. Privacy was quite out of the question to all except the topmost dwellers. On the whole they seem a peaceful crowd nowadays, although the Southern temperament gets out of hand occasionally.

When Prince George's ship visited Malta, he was taken down under escort, and was extremely interested. I wonder how he compared it with any of our English slums?

J. P.



[Photo: Charles E. Brown

"Ready to Take Off"

THE DAY'S WORK WAY DOWN EAST

BY LEADING-AIRCRAFTMAN 43.

OVERNIGHT the ship's orders read:

0530. Call the hands.
0720. Cooks.
0730. Breakfast.
0815. Special Sea Duty Men.
0830. Weigh and proceed to sea.

To us hybrids—sailors-cum-airmen—this is interpreted as "deck-landing."

The next morning finds us on the flying deck at 0600 hours, after a last-minute separation from our hammocks and the usual hasty "lash-up." Roll call! and we stumble down the hatches to the hangar. All our machines, six III'Fs., resplendent in their coat of shining mail (bright work) that is at once the pride and despair of the F.A.A., are serviceable. We proceed to move them to the flying deck. The tails are devilish heavy and the manipulator of the tail trolley has great difficulty in steering clear of (a) the stripping shop hatch, and (b) the ladder leading to signal platform. We are helped in our efforts by a certain amount of panic on the part of our overseer. However, we push them, one at a time of course, on to the lift. The lift operator, after a consultation with the duty J.I. who performs mysterious operations overhead, turns his wheel, and, to the accompaniment of a hidden buzzer switch and gargantuan growlings from the nether regions, we rise to the flying deck. It is nearly day, and at the sight of the paling stars we recall our motto, "Per ardua ad astra." Once on the flying deck the going is easier. We place the machines in their order of take-off. We do not position them correctly first time, but then we do not expect to be successful at the initial attempt. We console ourselves by singing our deck-landing song (*sotto voce*), which runs:—

"Fold 'em, spread 'em,
Start 'em, stop 'em,"

after which it becomes purely colloquial.

Metaphorically spitting on our hands, and full of that gentle inner glow that is the accepted accompaniment of the consciousness of work well done, we repair to our ablutions and breakfast. One glance

at the fare dispels that glow. We are offered "trainsmash," or bacon and tomatoes, so called because of its wrecked appearance and sanguinary colour. However, we must live, and so we break our fast in a manner reminiscent of Bacon's essay on "Books"—"eated," "chewed," and "some inwardly digested." We adjourn to the batteries for a smoke and the inevitable talk, leaving the cook of the mess to this thankless task. It is extraordinary the number of subjects that are discussed in the brief interval between breakfast and "turn-to." That (accentuated) peach in the Del Monte at Tsingtau is robbed of any shreds of character that she may possess, and the latest developments in swash-plate engines is dismissed as useless almost in the same breath. We take no part in the weighing, although to hear us moan at times one would think that we ran the vessel. The screws churn up the mud from the bottom, and followed by an attendant destroyer we head for the open sea. We soon find the wind, so no doubt the genial—if incomprehensible—patriarch who presides at the Temple of the Four Winds has invoked the aid of the horses of the air for the "Figi men." Several brass hats and other dignitaries from the mainland are aboard, as for the nonce we are a "show-boat." The flying deck now carries nine "Catchers" forward of the F's. The signal comes to "start 'em up." We wind them up with varying success. Mine starts at once, but one "Catcher" is wheeled out of place and dumped over on the starboard side, aft the crane. Some obscure trouble, no doubt, but it is not done to fuss around and inquire what, as the crew do not like it and say so in no uncertain tones. I sit at my ease, watching water and oil temperatures. A few turns of the retractable radiator handle and soon the engine is warm. I give up my seat to my pilot and report "O.K." The "run up," and the engine is O.K. The speed flag men are busy stringing up pennants from the superstructure yard-arm, and the whisp-like plume from the steam yet shows that we are well and truly into wind. The passengers climb into the cockpits. One of them, a stalwart sailor-man sporting a magnificent bronze beard, looks like some Viking who has strayed from his natural element. Alas! the donning of helmet and a standard life-saving jacket destroys the illusion, and it is borne in upon me that Romance and Aviation do not mix, despite the Blackburn Bluebird Honeymoon express.

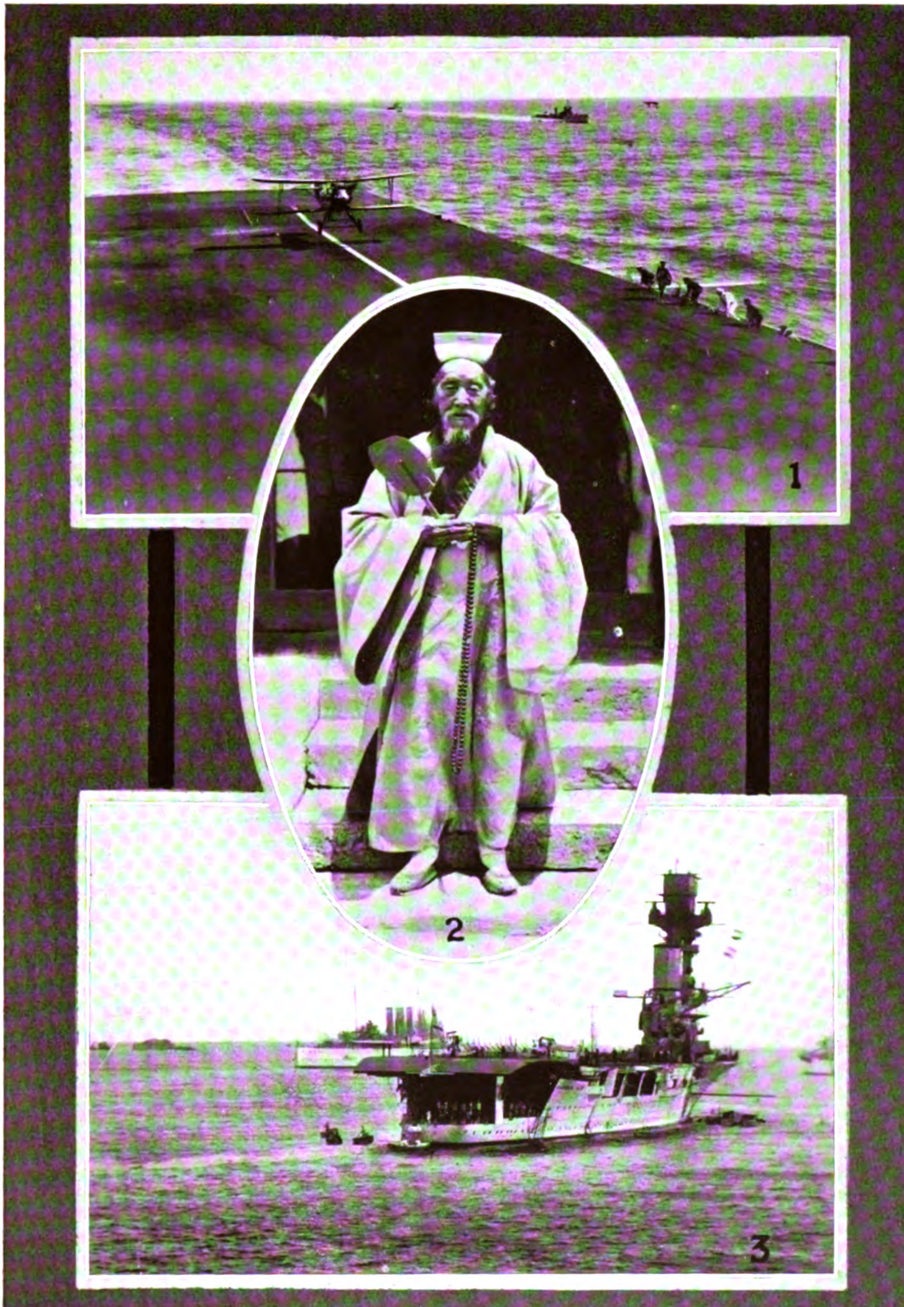
Now appears on the scene that great personage, the Deck Officer He is an impressive figure as he strolls from machine to machine, pausing at each to bellow a questioning "O.K.?" Had Rider Haggard met him he would undoubtedly have cast him for the rôle of a male "Ayesha," she who must be obeyed. In every case an affirmative answer is given. This duty done, he returns and stands forward and to the port of the first machine in such a position as to be in full

view of the pilot. A great pennant flutters from the bridge, the signal to be off. Turning, "Joe" takes his signal flag from an attendant satellite. A downward wave of his muscular arm, and the forward chocks are pulled away. A sideways sweep of the flag and the pilot opens up with a roar and charges along the deck, leaving the rear chockmen prostrate. They rise and make for the safety of the nets. Soon all that is left of the going of the machines is a trail of oil marking their positions on the deck. We separate to our respective deck landing stations. Mine being forward of the superstructure, I puff a surreptitious weed. This must be done furtively, for fear of the "Jaunty" and the wrath-to-come. A pleasant hour is passed in talk, or, less pleasantly, in clearing up the hangar. This is an endless task by reason of the waves of flotsam and jetsam that seem to break into our sanctuary.

We are warned of the approach of our "kites," and climb to the flying deck to play our part, in anything but a "smart and airman-like manner." The "Catchers" land first and are stowed away. The ship is speeded up to twenty knots, and after a furrow-browed consultation between "Joe" and a portable airspeed indicator the recall signal is put out. The first "F" lands well up the deck, but we rush out and manage to bring it to rest just abaft the forward lift. In a very short space of time the tail is on the trolley, camber pins out, wings folded, and the machine "jockeyed" into position on the forward lift. The lift descends and the stowage party trundle the machine into the hangar, the lift rising immediately. A touch of humour is supplied by "Joe." Seeing a "chippy," complete with hammer, without which a shipwright is lost, standing in the fairway away from the shelter of the superstructure, "Joe" adjures him by no known joss to "Get back! man, etc.," as he is creating an air current which will upset the stability of the oncoming "F." All this despite the fact that his own eighteen square feet of surface area is well to the centre of the deck. The machine touches way down aft, and a stentorian "Out" prepares us to arrest its progress. However, the pilot decides to try again, and we are treated to the spectacle of the high priest of ceremonies making obeisances to his deity. Of course he may have thought that he was in danger of being struck by his juggernaut. Somehow he never recovers his good head in our eyes after that! All the machines land without incident, and we go to dinner.

After dinner—I say little about it (you know the adage)—we proceed to "fall over" in the mess or in the hangar. "Sleep is essential in the tropics" says a leading medical authority, and one cannot be too careful out here. We are recalled from the land of Lethe and find ourselves once again in the land of "wonderful reality." Give me

"beautiful nonsense" any time. Soon the machines are positioned and "started up." I am "booked" for a flip, so I stroll about with that air of "je ne sais quoi" that is the outward bearing of Lindbergh and all other heroes. I climb into the cockpit behind the pilot and carelessly fling on a Reid jacket. I do not wear helmet or goggles—none of us "ack emmas" do, that is a custom peculiar only to such lesser mortals as pilots, observers and "sparkers." My fellow-sufferer proves to be my rigger. Deck-landing, owing to our small deck, is quite an adventure, and I feel a trifle uneasy. We both strive to appear insouciant and imagine that we succeed despite the ribald remarks and inquiries that come from our "one leg on the deck" associates, as to our favourite flowers. I hate waiting, and I feel relieved when the familiar bump is felt as the machine hits the folded forward windscreen and we are "off." We naturally stand up as we take off—all dare-devils do so—but a climbing turn causes us to sit down. We are alone with our thoughts. I sympathize with the ancient mariner and his tiresome tale of "we were in the first that ever burst," etc. Brother adventurers, he and I. I turn my attention to my Reid jacket. It is deflated, as to be seen wearing an inflated jacket would be to lose caste in the eyes of our fellow-men. We have argued it out on the mess-deck and we are unanimous in the opinion, on the mess-deck, that they would be useless in case of a crash. However, at an early age I learned wisdom from the words of the defender of Mafeking, and the ca' canny motto works upon my sub-conscious self to such an extent that I inflate the rubber belt. I turn round and am surprised to find that my comrade has done the same. Our eyes meet in a guilty glance. We shall not tell; our mutual crime is too heinous. Now we are in close formation. The leader in front and we on his left, with another machine (45) on his right, take up a too-perfect arrow-head course. I feel sure that we shall lock planes, so, like the notorious Captain Jenkins, I commend my soul to my Maker and my cause to my country. I take heart at this sententious philosophy, and begin to take an interest in proceedings. We break formation, and despite my faith I feel relieved. Thrills come my way again as we practise "junk hopping" as an alternative to "hedge hopping." I feel almost disappointed when the pilot passes a note back to me telling me of his intention to land because of a strong smell of petrol. Sure enough, I can smell it, and I begin to thing of the Pyrene, little use though it may be. We turn about and head for the ship. How small she seems from 2,000 feet up. "Can we land on that?" Yet the destroyer looks like a Baby Austin in the wake of a General omnibus. We make our approach from a height of 500 feet. We glissade down towards the turtle back. No reading on the altimeter and the flying deck looms near. I release the pressure on my jacket. It might be of some use



1. Landing On. 2. The Patriarch. 3. The Ship.

in the event of sliding over the side, but one always makes sacrifices to keep up appearances. A good hearty bump, a diminuendo of lesser bumps, and we have made a perfect "three-pointer." Many hands check our run and the machine is hastily stowed away. Examination reveals a split seam in the top tank and I have a job of work to do.

The rest of the machines all make safe descents, and the sun is still high in the heavens when we return to that island which has been facetiously called "the Eden of the China Seas." Lots of Adam, little of Eve, and no serpent, give the lie to that.

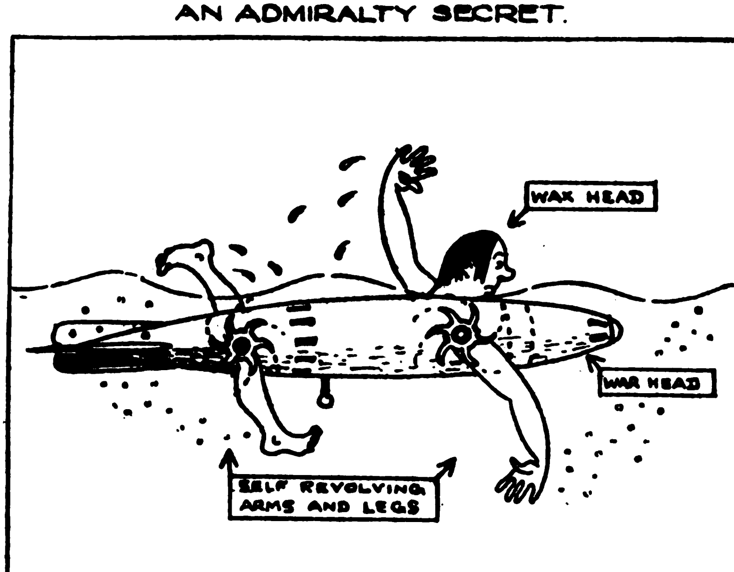
We drop hook as the sun sets, and even the most worldly of us cannot but appreciate the spectacle of the blood-red sky, as the sun sinks behind the ominous crags of the mainland heights.

We feel at peace with the world, for, to plagiarise a well-known couplet:

Home is the sailor, home from the sea,
And the airman is home from his scare.

The day's work over, we walk the flying deck, write home, or kill time to the best advantage, and as we turn in we mentally score off another day of the commission.

AN ADMIRALTY SECRET.



THE "CHANNEL SWIM" TORPEDO

CHIEF OF KALTUNGO'S ACCOUNT OF HIS VISIT TO BAUCHI IN NOVEMBER AND OF THE TWO AEROPLANES WHICH HE SAW THERE

WE went to Bauchi, and we saw something that everybody declares he has never seen. It came to us travelling in the sky, making a noise like the sound of a great rushing wind—o-o-o. There was a large piece of cleared ground, and we, a great multitude, surrounded it. The thing came, circling the air, receding and returning as a bird tracks the sky. Round and round it went, over the heads of the crowd, round the cleared ground, over the town of Bauchi, round its wall, round everything, up in the sky, never coming to rest upon the ground.

O-o-o-o-o it went. And the people said, " It will fall on us and kill us." Many raised their hands and spread them out over their heads as though to shield themselves against the noisy thing soaring above them. Others, chaffing these, said, " What would you with your outstretched arms? Is it going to fall, that you should get ready to catch it?"

When you look at that thing high up in the sky it is like a fish; its tail is like that of a fish, its side-whiskers are like those of a fish.

There appeared a second one behind the first. One of the men (*i.e.*, one of the "planes," the first one) descended low to alight like a bird. The noise in our ears—ur-r-r-r-r—was dreadful enough to knock us down. Along on that low level he went gliding—oh! so smoothly—for a distance equal to that between my house here and the rest house yonder. Then, coming to the ground, he ran along to the big white men of Bauchi and Gombe and stopped, and soon all were engaged in mutual greetings. The man behind, who all this while had been making rings in the high sky, descended, followed the steps of his brother, dropped where he dropped, and ran on the ground as his brother ran, up to his fellow-whites, who engaged with him in talk.

Their drop to the ground was as the drop of a bird that alights for meat that it has seen. When it comes to drop, it does not alight right at the meat, but at a distance removed, then runs along the ground to the meat, which it forthwith devours. It is afraid that, should it drop directly on the meat, men will observe its drop and come upon it and snatch away the meat. So those men dropped to the ground, not right at the feet of the white men, but at a spot removed, and ran forward on the ground until they came up to them.

We chiefs were called, and we went. The *Joji* (Resident) showed us to the men who had descended from the sky, and these saluted us, inquiring about the health of ourselves and our people. The big white men of Bauchi and Gombe asked us whether we had ever seen such a thing, and we said, "No; this is our very first sight of it." The men who had come down from the sky asked, "You were taking notice, weren't you?" "We were, indeed," said we. "Good," said they, "just do take notice. Here is the thing it flies by, the wings by which it rises. The thing is a knife, long, sharp and glittering, like the saw with which you cut your trees, except that it has no teeth." One of the fliers had re-entered the thing. I was about to move up closer to have a good look at the knife, but I drew back with the *Joji* cautioning me not to go too near. And just at that the man inside gave something a turn. Ki-ti-ti, Ki-ti-ti, went the thing, and the knife went round and stood straight up and down.

When that was over we went away and slept in Bauchi town, leaving the white men at their place.

Next day we all returned: all we chiefs—the big-town chiefs and the hill chiefs—all of us and the general multitude. We all gathered and set ourselves as on the previous day. "They will rise," we said, "and we shall see them rise."

The man who descended first the day before, now entered his thing. Then he ran along the ground till he reached the place where he first touched the ground the day before. There he began to rise, and went up and up, then circled round and round above our heads and over Bauchi town. When he made rings above our heads in that manner the people said, "That is the way he says 'Good-bye.'" And presently he turned his head and made off away from us. Then his brother left the big white men of Bauchi and Gombe, ran straight along the ground, flew up at the point where the first man rose, circled the air in like manner, and flew off after him, and we saw them no more.

As I looked up at them flying about, I said, "They will just play a bit and then return. While we beheld they made away, and we saw them no more!"

Men said, "How was it done?" In a moment, while we were thinking "they will have just a bit of play and then return," off they went beyond our sight! All men, therefore, who witnessed that—even the Hausas, all and sundry—were seized with fear. They said, "There is none like the white man. None can match him. The white man has God. What we have seen mere man could not do: God alone could do it. The white man's works are the works of God, not of man." These were the exclamations of the people.

What does that thing ascend upon? Where is the thing she made the climb on? One climbs a tree by taking hold and going.

Even the tall palm is climbed by man, but he has something to fasten to as he goes up. What, though, did that thing hold on to to climb up on? That thing is a marvel. The motor-car (a sufficiently new thing to the chief)—the motor-car runs along on the ground, and that is all right. If anything goes wrong with it you can fix it. But that other thing of which I speak, if anything goes wrong with it, what wisdom have you? You're a dead one!

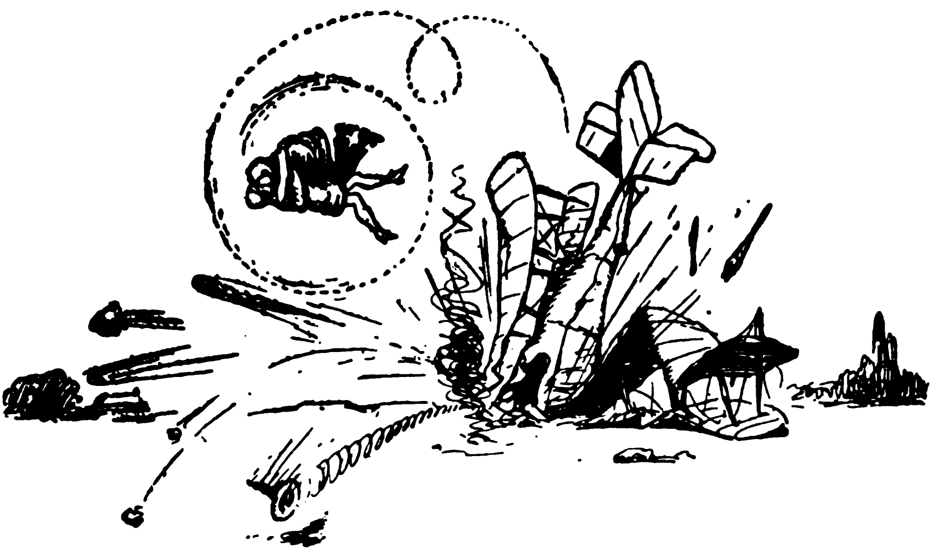
If I should be asked to take a ride on the thing I should be too afraid to do it. And I am thinking a black man could not voluntarily take the ride. If one did, it would be a bold black man; but it would be in company with the white man, on whom he could depend and take courage. A black man could not ride it by himself. And I am quite sure that the white man would not dare to let a black man try it all by himself.

I do not see how anyone could fight with the white man who uses that thing. Supposing someone should want to shoot him with a gun, he would just fly off, and the shot could not reach him. And he-of-the-thing (*i.e.*, the flier) could shoot all *he* wanted to and slaughter the people on the ground or, with fire, burn them up. Ah! a man of that kind cannot be classed with men; he is greater than all men.

They put a black man, a policeman of the Caladima of Bauchi, into the thing at Jos (eighty-six miles away by road) and brought him on to Bauchi. There were two black men put in, one in each sky-motor-car. One of them got no hurt, but it went badly with this one I started out to speak about. They put him in and they shut the door on him. The thing began to rise, and his mind was seized with an awful fear. In a moment his soul left him, and he knew no more. He did not know he was going. He did not see himself going through the sky. He felt as though he were dead and laid out for burial. He felt like a man of whom a demon has taken hold all the way to Bauchi, and he did not know he had arrived until the doctor, to whom he was immediately carried, brought him back to life.

There was something terribly uncanny, though—something really wicked—about the striking-the-wire business. That first day, when we had all assembled, the announcement was given "All have gathered." So the wire was struck for the men at Jos (*i.e.*, a telegram was despatched to the fliers eight-six miles away by road). And right on the now-now, with little ensuing space of time, the things burst upon our sight. That did put dread upon us. We said, "Where has gone the intervening space that at the moment of striking the wire these things should fly into our view? Therein is a marvel!"

From of old our people have been sitting in the dark, but now the eyes of our people are beginning to clear with partial knowledge.



RUTHLESS RHYMES FOR FEARLESS FLYERS

BILL.

Bill, a very noble Lord,
Flew with Kings and Queens aboard;
And every time a Queen was missed,
He cried, "I am a Socialist!"
And every time he dropped a King,
He cried, "Democracy's the thing!"

MABEL.

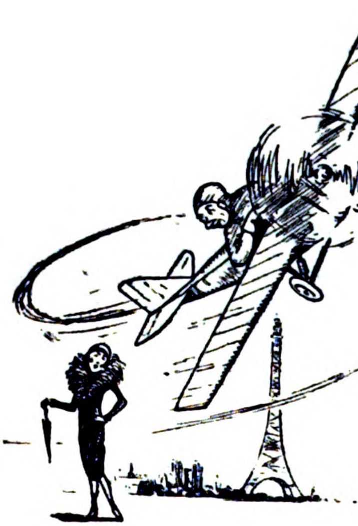
Mabel, flying over London,
Felt her safety belt was undone.
The pilot looped, as he was able,
And waved a fond adieu to Mabel.

R.P.M.

Henry Archibald de Vere
A propeller went too near.
Archie left this world of sin
At fifteen hundred revs. per min.

NO CONTROL.

I love to hear of little Tim,
Who took his bride to fly with him;
They kissed and kissed—alas, alack,
He did not pull the joystick back.



ENGINE TEST.

Squadron-Leader Henry White
Climbed to an enormous height;
But when to earth he spun and fell,
The engine stood the crash quite well.

AIR ROUTE.

Robert Henry Charlie Harris,
Flew direct from Lympne to Paris;
A midinette made eyes at him,
He zig-zagged back Paris Lympne.

THRIFT.

Into a garden Herbert crashed,
The aeroplane completely smashed;
The lady of the house cried, " Good,
" We were out of firewood."

FRED.

" Fly not the Pass," the old man said,
" I'll fly to Hades," answered Fred.
He flew the Pass, and struck a peak—
He's due in Hades Friday-week.

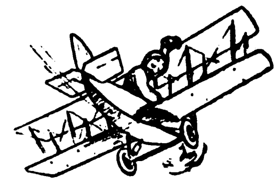
PERCY.

When Percy, on his honeymoon,
Flew beneath the silv'ry moon,
He lost his way, for love is blind,
And left his native shores behind;
And people cried, " Oh, how romantic!"
When they were lost in the Atlantic.

ENTRÉE.

Lionel Lamb, Croydon's pride,
Stunted o'er the countryside,
And made the hair of maidens curly,
Who gazed at him from High Street,
  Purley;
He came too low when over Sutton,
Converting Lamb at once to mutton.
If he should have another crash,
'Twould definitely cook his hash.

THE UNDERCARRIAGE.



Jock MacTavish, one clear night,
Gave his lady-love a flight.
She'd thick legs and ankles, so
He side-slipped and let her go;
Muttering as he watched the lassie,
" I liked her face but not her chassis."

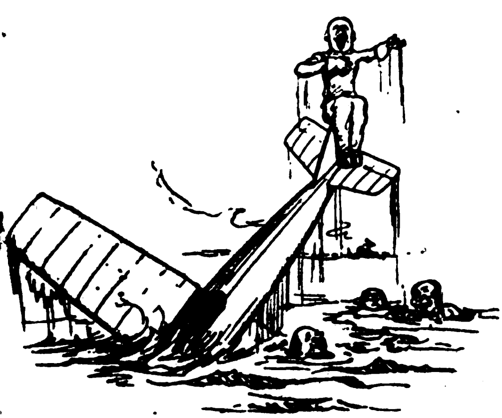
THE CAT BURGLAR.

Bill the Burglar, species feline,
Tried for France to make a bee-line;
Climbed upon a plane at Lympne,
Hoping none would notice him.
Half across the Channel gone,
Bill got bored with hanging on,
Took his nine lives in his hand,
Reached the sea, but not the land.

PURITY.

Our curate is a flying man,
And takes the air whene'er he can.
Last week he crashed into a sewer,
But to the pure all things are pure.

GRAND OPERA.



A pilot, whom both I and you know,
Practised songs from Charlie Gounod.
His engine failed when nearing Lympne,
And all on board were forced to swim.
The pilot's spirits were not doused,
He sang the Jewel Song from "Faust."

THRIFT.

Angus Mackay flew up in the sky,
And cut off his petrol ten thousand feet high.
He dropped like a stone as he went to the deuce,
But think what he saved in petroleum juice!

HANDS DOWN.

Heavy-handed Herbert Pye
Really tried to learn to fly.
He broke all records, landing fast,
And broke his silly neck at last.

CHORUS GENTLEMEN.

Squadron-Leader Joseph Burns,
Took to doing fancy turns.
But once the rudder jammed, and so
They sang the chorus, "Poor old Joe."

HIRE PURCHASE.

Pilot Fritz when o'er New York,
Crashed in bits and ceased to talk.
The Yankee adver-*tise*-ment ran
" We bury on instalment plan."

ONE POINT LANDING.

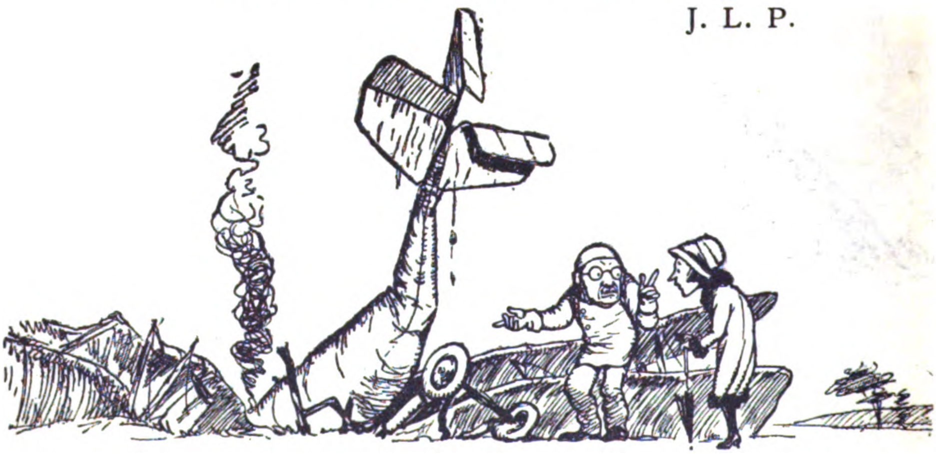
When Uncle Jimmy, landing slow,
Tore off his undercarriage,
He remarked, " 'Tis wheel and whoa
" In flying as in marriage."

DON'TS FOR GROUND ENGINEERS.

Don't say the pilot weighs so much
  He ought to try a course of Banting;
Don't say he's got a heavy touch
  Or tootsies that are elephantine.
(He may, in fact, get all your goat,
But when he crashes, *then* you'll gloat.)

Don't let your Aunt Matilda stay
  Too near the tails of aeroplanes.
Point out she's in the slipstream's way,
  And that the wind's not autumn gales.
Just be a thoughtful kind of feller
And stand her close to the propeller.

J. L. P.



ROYAL AIR FORCE

THE KING
Chief of the Royal Air Force.

AIR COUNCIL.

Secretary of State for Air (President of the Air Council):
Brigadier-General The Right Hon. Lord Thomson, P.C., C.B.E., D.S.O., *p.s.c.*

Under-Secretary of State for Air (Vice-President of the Air Council):
F. Montague, Esq., M.P.

Chief of the Air Staff:
Air Chief Marshal Sir John M. Salmond, K.C.B., C.M.G., C.V.O., D.S.O., A.D.C.

Air Member for Personnel:
Air Vice-Marshal T. I. Webb-Bowen, C.B., C.M.G.

Air Member for Supply and Research:
Air Marshal Sir John F. A. Higgins, K.C.B., K.B.E., D.S.O., A.F.C.

Deputy Chief of the Air Staff (Additional Member):
Air Vice-Marshal C. L. N. Newall, C.B., C.M.G., C.B.E., A.M.

Secretary of the Air Ministry:
Sir Walter F. Nicholson, K.C.B.

R.A.F. COMMANDS (HOME).

Air Defence of Great Britain.

Headquarters: Hillingdon House, Uxbridge, Middlesex.
Air Officer Commanding in Chief: Air Marshal Sir Edward L. Ellington, K.C.B., C.M.G., C.B.E., *p.s.c.*

Wessex Bombing Area.

Headquarters: Andover, Hants.
Air Officer Commanding: Air Vice-Marshal Sir John M. Steel, K.B.E., C.B., C.M.G.

Fighting Area.

Headquarters: Hillingdon House, Uxbridge, Middlesex.
Air Officer Commanding: Air Vice-Marshal H. C. T. Dowding, C.B., C.M.G., *p.s.c.*

No 1 Air Defence Group.

Headquarters: 145, Sloane Street, Sloane Square, London, S.W.1.
Air Officer Commanding: Air Commodore W. F. McNeece Foster, C.B.E., D.S.O., D.F.C.

Inland Area.

Headquarters: Bentley Priory, Stanmore, Middlesex.
Air Officer Commanding: Air Vice-Marshal A. E. Borton, C.B., C.M.G., D.S.O., A.F.C.

No. 21 *Group* (*Stores and Depot*).

Headquarters: West Drayton, Middlesex.
Officer Commanding: V.C. Group Capt. L. W. B. Rees, O.B.E., M.C., A.F.C., A.D.C.

No. 22 *Group* (*Army Co-operation*).

Headquarters: South Farnborough, Hants.
Air Officer Commanding: Air Commodore N. D. K. MacEwen, C.M.G., D.S.O.

No. 23 *Group* (*Flying Training*).

Headquarters: St. Vincents, Grantham, Lincs.
Air Officer Commanding: Air Commodore P. B. Joubert de la Ferte, C.M.G., D.S.O., *p.s.a.*

COASTAL AREA (FLEET AIR ARM AND NAVAL CO-OPERATION).

Headquarters: 33-34, Tavistock Place, London, W.C.1.
Air Officer Commanding: Air Vice-Marshal C. L. Lambe, C.B., C.M.G., D.S.O.

No. 10 *Group* (*Naval Co-operation*).

Headquarters: Lee-on-Solent, Hants.
Air Officer Commanding: Air Commodore A. W. Bigsworth, C.M.G., D.S.O., A.F.C.

ROYAL AIR FORCE COLLEGE, CRANWELL.

Headquarters: Cranwell, Lincs.
Commandant: Air Vice-Marshal A. M. Longmore, C.B., D.S.O., *q.s.*

ROYAL AIR FORCE, HALTON (SCHOOL OF AIRCRAFT APPRENTICES).

Headquarters: Halton Camp, Bucks.
Air Officer Commanding: Air Commodore I. M. Bonham-Carter, C.B., O.B.E.

ROYAL AIR FORCE STAFF COLLEGE.

Headquarters: Andover, Hants.
Commandant: Air Commodore E. R. Ludlow-Hewitt, C.B., C.M.G., D.S.O., M.C., *p.s.a.*

R.A.F. COMMANDS (OVERSEAS).

ROYAL AIR FORCE, MIDDLE EAST.

Headquarters: Villa Victoria, Cairo.
Air Officer Commanding: Air Vice-Marshal F. R. Scarlett, C.B., D.S.O.

Transjordan and Palestine.

Headquarters: Amman (moved to Customs House, Jerusalem, temporarily).
Air Officer Commanding: Air Commodore P. H. L. Playfair, M.C.

IRAQ COMMAND.

Headquarters: Hinaidi, Iraq.
Air Officer Commanding: Air Vice-Marshal Sir Robert Brooke-Popham, K.C.B., C.M.G., D.S.O., A.F.C., *p.s.c.*

ROYAL AIR FORCE, INDIA.

Headquarters: Kelvin Grove, Simla.
Air Officer Commanding: Air Marshal Sir W. Geoffrey H. Salmond, K.C.B., K.C.M.G., D.S.O., *p.s.c.*

No. 1 (*Indian*) *Group.*

Headquarters: Peshawar, India.
Officer Commanding: Group Captain H. Le M. Brock, D.S.O., *p.s.a.*

No. 3 (*Indian*) *Wing.*

Headquarters: Quetta, India.
Officer Commanding: Wing Commander J. O. Archer, C.B.E.

ROYAL AIR FORCE, MEDITERRANEAN.

Headquarters: Valletta, Malta.
Air Officer Commanding: Air Commodore J. L. Forbes, O.B.E.

ADEN COMMAND.

Headquarters: Steamer Point, Aden.
Officer Commanding: Group Captain C. T. Maclean, D.S.O., M.C.

Far East Command.

Headquarters : Singapore, Straits Settlements.
Officer Commanding : Group-Capt. H. M. Cave-Browne-Cave, D.S.O., D.F.C.

AIR ATTACHES TO EMBASSIES AND LEGATIONS.

Headquarters.	*Accredited to.*	*Name and Rank.*
Paris	Paris, Belgium, Holland	Group Captain R. J. Bone, C.B.E., D.S.O.
Washington ...	U.S.A.	Wing-Commander T. G. Hetherington, C.B.E.
Rome	Italy, Greece.	Group Captain C. R. S. Bradley, O.B.E.
Buenos Aires ...	Argentine, Brazil, Chile, Uruguay.	Wing-Commander E. H. Johnston, O.B.E., D.F.C.
Berlin	Germany, Norway, Sweden, Denmark.	Group Captain E. L. Gossage, D.S.O., M.C., *q.s.*

DOMINION LIAISON OFFICERS.

Australia.—Flight Lieutenant W. Palstra, M.C., *p.s.a.*, Room 523, Australia House, Strand, London, W.C.2.

Canada.—Squadron Leader A. B. Shearer, Air Ministry, Adastral House, Kingsway, London, W.C.2.

New Zealand.—Major T. M. Wilkes, M.C., Air Ministry, Adastral House, Kingsway, London, W.C.2.

APPOINTMENTS.

Rank and Name.	*To.*	*Date.*	*Remarks.*
Air Commodore			
A. G. Board, C.M.G., D.S.O.	Station H.Q., Heliopolis	11/1/30	Attached for temporary duty with Cape—Cairo Flight. 1930.
Group Captains			
G. I. Carmichael, D.S.O., A.F.C.	H.Q., R.A.F., India	20/12/29	Supernumerary. On completion of course at Staff College, Quetta. Pending posting to Iraq.
R. E. C. Peirse, D.S.O., A.F.C.	H.Q., R.A.F., Middle East	6/1/30	Attached for temporary duty as Chief Staff Officer.
E. M. Murray, D.S.O., M.C.	R.A.F. Depot, Inland Area	21/1/30	Supernumerary whilst attending Senior Officers' Technical Course (Part II) at H.M. Dockyard, Portsmouth.
L. A. Pattinson, D.S.O., M.C., D.F.C.	R.A.F. Depot, Inland Area	29/1/30	Supernumerary, pending posting. On transfer to Home Establishment.

PERSONNEL.

Flying Training.

During the period January 1st, 1930, to February 28th, 1930, the following completed courses at Flying Training Units :—

	Officers.	*Airmen.*
C.F.S. Instructors' Course (Short)	1	—
Refresher Course	1	—
No. 1 F.T.S.	28	4
No. 4 F.T.S.	12	15
Naval Officers	9	—
Auxiliary Air Force...	1	—
Conversion Courses	1	1

Officers—Electrical and Wireless School, Cranwell.

Three officers passed Short Signals Course ending December 6th, 1929.

Aircraft Apprentices—Electrical and Wireless School, Cranwell.

Numbers passed out, December, 1929 :—

L.A.Cs.	10
A.C.1's	35
A.C.2's	16
Total	61

Of the above 2 L.A.Cs. were granted Cadetships.

Aircraft Apprentices—School of Technical Training (Boys), Halton.

Numbers passed out, December, 1929.

L.A.Cs.	44
A.C.1's	215
A.C.2's	64
Failed	1
Total	324

Of the above 1 L.A.C. and 1 A.C.1 were granted Cadetships.

PRACTICE CAMPS.

R.A.F. Practice Camps will be opened again this year at North Coates Fitties, Catfoss and Sutton Bridge, on April 1st, to provide facilities for exercising Squadrons of the Inland Area and Air Defence of Great Britain Commands in air firing and bombing.

SERVICE FLIGHTS.

A flight of four Fairey IIIF aircraft of No. 14 Squadron carried out the annual service flight from Cairo to the Cape and return. The flight left Cairo on January 11th and returned on February 24th, and has kept to schedule throughout. A flight of the South African Air Force has accompanied the R.A.F. flight to Cairo on the return journey.

AIRCRAFT CARRIERS.

H.M.S. *Hermes* carried out normal routine flying in conjunction with other ships on the China station.

H.M.S. *Furious* and H.M.S. *Argus* embarked their respective flights from Gosport and proceeded with the Atlantic Fleet on the Spring Cruise.

H.M.S. *Eagle* has carried out normal duty with the Mediterranean Fleet, and is taking part in the exercises with the Mediterranean Fleet during the Spring Cruise.

H.M.S. *Glorious* expected to complete its reconstruction as an aircraft carrier on March 10th, 1930.

H.M.S. *Courageous* returned to Home Waters in January, and disembarked flights to Gosport. Now retubing at Devonport. Date of completion uncertain.

Overseas Commands

IRAQ.

Situation in the Southern Desert.

As a result of an unsuccessful rebellion in Nejd against their ruler, Ibn Saud, certain Akhwan Sheikhs with their fighting men, women and children and flocks, took refuge in Koweit territory. As it was contrary to the policy of His Majesty's Government to allow the rebels to seek sanctuary in either Iraq or Koweit, steps were at once taken to deal with them. The position was somewhat delicate, however, for if the rebels were ejected by force, they would be driven into the hands of Ibn Saud, who was waiting on the other side of the frontier with a large force, and His Majesty's Government would have to face the charge of being responsible for the massacre of women and children, which may have resulted from this action. Every effort was at first made to persuade the rebels to surrender, but without effect. Owing to the boggy nature of the ground, due to heavy rains, the effective use of armoured cars was rendered extremely difficult and it was therefore decided to take air action of a limited nature. Accordingly, on January 6th and 7th, a few light bombs were dropped in order to turn some isolated bodies of camels, who were moving north and had reached a point within thirty miles of Koweit town. The result of this action was at once manifest; Naif Ibn Hithlain, the Sheikh of Ajman, with the whole of his tribe, surrendered unconditionally to the Royal Air Force commander. The other rebel leader, Feisal ad Dawish, Sheikh of the Mutair tribe, still declined to surrender and continued his march southwards towards the Nejd frontier. Here Ibn Saud with a large force was moving to head him off, and Dawish, unable to face the meeting with Ibn Saud, which was inevitable should he continue his march into Nejd territory, and not wishing to subject the Mutair to further air action, surrendered unconditionally with his tribe to the Royal Air Force commander on January 9th. A complicated situation was thus brought to a satisfactory conclusion without the need for drastic air action and without the infliction of casualties to either side. The rebel leaders have now been handed over to Ibn Saud, under certain conditions, which include an assurance that they would not be put to death. The tribes, with their flocks,

left Koweit escorted by Armoured Car Sections of the Royal Air Force and have now returned to Nejd.

In view of the presence of Ibn Saud in the proximity of the Iraq—Nejd frontier, opportunity was taken to arrange a meeting between him and King Feisal of Iraq in order to discuss the settlement of outstanding questions.

PALESTINE.

The situation in Palestine remains quiet except for minor disturbances in the Safed area. A composite force consisting of detachments of the Transjordan Frontier Force, British infantry and No. 6 (A.C) Squadron, assisted by the police, are operating against the bandit gangs in this area and several arrests have been made.

TRANSJORDAN.

A recrudescence of trans-frontier raiding between Transjordan and Nejd tribes occurred during the period under review. With the object of arresting the offenders and putting a stop to further raids, a force consisting of two troops of Transjordan Frontier Force in motor transport, six aircraft of No. 14 (B) Squadron and one section of Royal Air Force armoured cars has been formed, and is operating from a base in the desert. Daily aircraft patrols are being maintained along the eastern and southern frontiers of Transjordan, a flight of No. 6 (A.C.) Squadron working from an advanced base which has been formed at Bair, and aircraft from No. 14 (B) Squadron operating from Maan and Amman.

SUDAN.

During December trouble was experienced in the district of Kordofan. A small section of Nuba tribesmen, led by one Mek Kabongo, had definitely defied the authority of the Government and had offered armed resistance to a police patrol, compelling it to withdraw. A small force of Camel Corps, accompanied by police and the District Commissioner, were dispatched to the scene of unrest and after a surprise attack the ringleader was arrested. On the following day, however, the Nubas retaliated, attacking the police and troops who were engaged in rounding up their cattle. One soldier was killed and the British officer in command and an N.C.O. were severely wounded, the Nubas' casualties being four killed. The enemy had established themselves in a strong position on a hill abounding in caves and it became clear that a stronger force would be necessary to induce them to surrender. Reinforcements numbering about three hundred Camel Corps were accordingly sent up, but during the week following the Nubas remained on the offensive and in view of the certainty of casualties on our side, if the rebels were attacked by infantry, it was decided to effect their surrender by the employment of aircraft. Air action by five aircraft of No. 47 (B) Squadron was therefore taken on December 24th and 27th and as a result the tribesmen surrendered and their position was occupied by the infantry under cover of the aircraft. The situation is now normal.

Further trials of aircraft fitted with float under-carriages were carried out in the Sudan during December and January. By fitting an improved type of propeller and floats, the difficulty of taking off experienced during the earlier trials was overcome, it being found possible to take off the aircraft fully loaded from calm water with no wind blowing. Considerable improve-

ment was also noticed in the landing of the aircraft and the ease of control when taxying. As a result of these trials it is considered that the aircraft fitted with the new type of propeller and floats will prove quite suitable for operations over the river and flooded areas of the Sudan.

SINGAPORE.

No. 205 (Flying Boat) Squadron.

With the object of collecting detailed information regarding seaplane and landplane emergency sites along the Burma coast, two flying boats of this squadron undertook a reconnaissance of this area. Both boats left Singapore on November 26th and, in addition to the places already visited on the Singapore—Calcutta cruises, inspected sites at Bassein, Cox's Bazaar and Kyaukpyu. The boats arrived back at Singapore on December 31st.

Auxiliary Air Force and "Cadre" Squadrons

1. Personnel.

(*a*) *Promotions—Regular Officers.*

Group Captain W. F. MacNeece Foster, C.B.E., D.S.O., D.F.C., to be Air Commodore.

In addition to the above, the following promotions from Flying Officer to Flight Lieutenant for Officers of the Auxiliary Air Force were approved with effect from the dates stated. All the Auxiliary Squadrons have now thereby for the first time been brought up to strength in Flight Commanders, and the Promotion List is a fitting commentary on the progress which has taken place in the Units concerned.

(*b*) *Promotions—Auxiliary Air Force Officers.*

No. 600 (City of London) (B) Squadron:	
G. W. H. Wallcousins	15/12/29
W. R. Massey	1/1/30
T. Courtis	18/1/30
No. 601 (County of London) (B) Squadron:	
H. N. St. V. Norman	1/1/30
No. 602 (City of Glasgow) (B) Squadron:	
J. S. Lennox	15/12/29
D. F. McIntyre	1/1/30
Marquess of Douglas and Clydesdale	15/1/30
No. 603 (City of Edinburgh) (B) Squadron:	
A. R. H. Miller	15/12/29
J. F. Fosbrooke	1/1/30
A. H. Bruce	16/1/30
No. 605 (County of Warwick) (B) Squadron:	
J. H. Leach	15/12/29
C. L. Knox, V.C.	1/1/30
G. V. Perry	15/1/30

2. Training.

(*a*) *Flying Hours for December, January and February.*

No. 501 (B) Squadron	...	141 hours.
No. 502 (B) Squadron	...	255 „
No. 503 (B) Squadron	...	164 „
No. 504 (B) Squadron	...	106 „
No. 600 (B) Squadron	...	194 „
No. 601 (B) Squadron	...	165 „
No. 602 (B) Squadron	...	127 „
No. 603 (B) Squadron	...	253 „
No. 605 (B) Squadron	...	144 „

(*b*) *Esher Trophy Competition.*

Preliminary arrangements are being made for the Esher Trophy Competition, which, in some minor details, will differ from that of previous years.

(*c*) *Bombing Facilities.*

The two Auxiliary Scottish Squadrons, No. 602 (City of Glasgow) and No. 603 (City of Edinburgh), have been very fortunate in obtaining, through the generosity of W. H. Paton, Esq., and the Marquess of Douglas and Clydesdale, sites for use as Practice Bombing Ranges. These are situated at Belstane and Dungavel respectively, and it is hoped they will be both in use this summer.

(*d*) *Grant of Flying Badge.*

Several officers of the Special Reserve and Auxiliary Air Force have obtained "Wings" during the past quarter, and a number of volunteer airmen have been examined for re-mustering and re-classification in trades as Fitter, Rigger, Photographer, Wireless Operator, and for qualification as Air Gunner.

3. Formation of New Squadrons.

The following Squadrons formed on March 17th, 1930 :—

No. 604 (County of Middlesex) (Bomber) Squadron, Hendon.
No. 607 (County of Durham) (Bomber) Squadron, Usworth.
No. 608 (County of North Riding) (Bomber) Squadron, Thornaby.

It has been decided to dispense with a Town Headquarters for No. 608 Squadron, and to provide the Drill Hall and necessary instructional buildings at the Aerodrome, a system which has proved satisfactory at No. 605 Squadron, Castle Bromwich.

Cambridge University Air Squadron

The Squadron has its full complement of 75 flying members. Over ninety applications for membership were received for the year 1929-30.

During the Michaelmas Term 300 hours' flying was put in at Duxford. Thirty-seven members are now qualified to fly solo and 36 are qualified pilots

in the Reserve of Air Force Officers. A further 14 applications from members for commissions in the Reserve have been forwarded to the Air Ministry. Besides these, 14 applications have been received from the undergraduates who are non-members. Two applications for permanent commissions were forwarded to the Air Ministry before Christmas, and it is expected that about six more members will come before the Board of Military Studies in May next for nomination.

The Squadron Annual Dinner took place on February 24th, at which about two hundred were present, including the Secretary of State for Air and the Vice-Chancellor of the University. This was a most successful evening.

Five members gained their rowing trial caps.

Twelve Course " A " R.A.F. Officers are now in residence.

The Annual Attachment will take place at Old Sarum during the six weeks beginning June 16th.

Oxford University Air Squadron

The weather during the Easter Term has been far more favourable for flying than it was in the Michaelmas Term. As a result, during the first half of the term members flew a total of 161 hours, of which 50 hours were solo flying.

Of the 75 flying members of the Squadron, 38 are qualified to fly solo in term-time, and 20 of these hold commissions in the Reserve of Air Force Officers. The total number of Reserve Commissions gained through the Squadron up to the end of 1929 was 43. The applications for Reserve commissions already forwarded in 1930 number 30.

As a result of the examinations in December, 1929, eight more members have gained their Proficiency Certificates; bringing the total since the certificates were introduced up to 44. Of the present members of the Squadron 29 already hold the certificate. The examination for the Easter Term took place on March 11th and 12th, but the results are not yet to hand.

The Third Annual Dinner of the Squadron took place on March 3rd, when the Chief of the Air Staff and the Vice-Chancellor of the University (Rev. F. Homes Dudden, D.D.) were present. There were also present a number of senior members of the Air Force and of the University, as well as old members of the Squadron.

On January 27th Major G. H. Scott, C.B.E., A.F.C., gave a lecture on " The Handling of Airships " to a crowded and enthusiastic audience in the new lecture hall, and on March 10th Mr. D. R. Pye, M.A., F.R.Ae.S., lectured to the Oxford Branch of the Royal Aeronautical Society on " The Evolution of the Modern Aero Engine."

On March 6th a visit was paid to Messrs. Napier's aero-engine works at Acton.

The Squadron will carry out its annual attachment in 1930 at Manston, Kent, between June 23rd and August 2nd.

Two members of the Squadron are at present rowing in the Varsity boat, and three members rowed in trial eights last December.

MEMORANDUM BY THE SECRETARY OF STATE FOR AIR TO ACCOMPANY AIR ESTIMATES FOR 1930.

The net total of Air Estimates which Parliament is asked to vote for the coming year is £17,850,000. The estimated net expenditure for 1929, as revised to include the recent supplementary estimate of £760,000, is £16,960,000. There is thus an increase of £890,000. Appropriations-in-aid are up by about £20,000, and the variation on the gross figures is to that extent greater than on the net.

The experience of the present year, as reflected in the revised estimate, has shown that the " super-cut " (or over-head deduction to discount possible underspending) of £650,000 assumed in the 1929 Estimates was altogether too large. Accordingly, in these Estimates it has been reduced to £150,000.

The following table shows the main features of the comparison (the original super cut for 1929 disappears, having been absorbed in the revised figures for that year) :—

	1930.	1929.*	+ or −
	£	£	£
True Gross (total of expenditure subheads) ...	21,073,800	20,013,100	+ 1,060,700
Deduct super-cut	150,000	—	+ 150,000
Gross Estimate	20,923,800	20,013,100	+ 910,700
Deduct Fleet Air Arm grant	1,267,000	1,067,000	+ 200,000
Deduct other Appropriations-in-aid ...	1,806,800	1,986,100	− 179,300
Net Estimate	17,850,000	16,960,000	+ 890,000

* Including supplementary estimate.

Owing to changes in the presentation of the Estimates in past years, the gross figures afford in some respects a better comparison than the net; and it is relevant to recall that five years ago the gross total of Air Estimates was materially higher than that now presented. Economies in the interval have enabled the figure to be reduced, notwithstanding the increase in the strength and activities of the Royal Air Force, the renewal of its equipment, the progress of civil aviation, and the numerous compelling claims of an advancing science and an adolescent service.

Generally speaking, these Estimates allow for a broad continuity of air policy, and in particular the outlines of the Home Defence Scheme are not prejudiced. For the coming year, however, the approved increases of the Royal Air Force are of small dimensions, and are designed to demonstrate once more the earnest desire of His Majesty's Government to avoid disastrous competition in air armaments. With this end in view the consolidation of the existing units of the Home Defence Force will be the main feature of the 1930 programme, and the only new unit to be added to that Force will be

one non-regular squadron. We shall thus have a breathing space in which to watch the development of the new spirit which informs pacific international instruments, such as the Treaty for the Renunciation of War and the Optional Clause.

The increases in various votes, such as those on Vote 1 (personnel), Vote 2 (quartering, etc.), Vote 3 (technical material) and Vote 7 (reserves) are such as are consistent with this policy, and are indeed mainly consequential on existing commitments which could not be reduced without impairing the efficiency of the Royal Air Force and the safety of its personnel. The decrease on Vote 4 (works) indicates that the programme of capital expenditure under this head is being advanced by even more modest stages. The increase on Vote 11 (non-effective) reflects the growing incidence of retirement, which has hitherto been very low, as is natural with a new service. That on Vote 8 (civil aviation) corresponds with further anticipated developments in civil air transport. This increase is modest but is proportionately higher than the increase on the service votes.

Strength and Distribution of the Royal Air Force.

The present strength of the Royal Air Force is approximately 70 regular squadrons (including the equivalent of 12 squadrons in the Fleet Air Arm) and 12 non-regular squadrons. During the financial year 1929 the formation of one regular squadron for Home Defence, one squadron of flying boats and four cadre or auxiliary squadrons has been put in hand; in addition, a torpedo-bomber squadron which was originally formed as an experimental unit has now been reorganized for normal service duties with a view to its proceeding to Singapore in the course of the current year.

In 1930 one flying boat squadron and one cadre squadron will be formed, but the chief developments will be in the advancing equipment of the Force as a whole and of the units which were formed in 1929 in particular. Two new flights which were contained in the Fleet Air Arm programme for 1929, and were deferred, are now included in the programme for 1930.

During the past year No. 203 Flying Boat Squadron proceeded by air to Basrah as forecast in the Air Estimates memorandum for 1929; the annual flight between Cairo and the Cape has been carried out with the co-operation of aircraft of the South African Air Force; and the long distance flight from Egypt to Nigeria has also been repeated, with, on this occasion, an extension to the Gold Coast.

It is proposed that a squadron of flying boats should carry out a cruise in the Baltic during the coming summer.

Operational Activities During the Past Year.

The chief areas of activity have been in the Middle East and the Sudan. The disturbances which broke out in Palestine were by their nature primarily a problem for ground forces, and 50 troops were transported by air from Egypt to Jerusalem within seven hours of the requirements being notified. Active reconnaissance and other protective duties were also carried out by aircraft of No. 14 Squadron, assisted by squadrons from Egypt, while for a short time reinforcements were provided by aircraft disembarked from H.M.S. *Courageous*. The armoured cars of the Palestine Command, with temporary reinforcements from other areas in the Middle East, also assisted in restoring order.

In the Sudan, air action was enlisted to repel a rising by a section of the Nuba tribe which had organized armed resistance to government. This intervention was entirely successful and enabled a force of infantry to occupy the enemy's position without casualties.

In the Aden Protectorate, local unrest which had manifested itself by interference with traffic and robbery of caravans was quelled by air demonstrations and by the dropping of warnings.

A more serious situation arose towards the end of 1929 in Koweit, on the southern borders of Iraq. Two fighting tribes of Nejd had made incursions into the territory of the Sheikh of Koweit, following an unsuccessful rebellion against King Ibn Saud, and stubbornly refused either to return to Nejd or to surrender to the British forces. In this case the threat of air action brought about the complete and unconditional surrender of the insurgents.

Personnel.

There has been an encouraging increase during 1929 in the number of applications for permanent commissions, both from the schools for cadetships at the Royal Air Force College, Cranwell, and from the universities for entry through the university commission scheme.

A revision has been made of the terms of enlistment of airmen. Aircraft apprentices and apprentice clerks who are entered at about the age of 16 for training to fill the technical and clerical trades respectively, will as heretofore be recruited for 12 years' active list service, counting from the age of 18, with no reserve liability. The non-apprentice entrants, however, will in future be recruited for 8 years' active list service with no reserve liability, instead of for varying terms with reserve liability. A proportion will, of course, be allowed to extend their active list service to 12 years and to re-engage to complete 24 years' service for pension. Those who are due for discharge after 8 years' service will be invited, up to the numbers required in the several trades, to enter the Reserve, and it is hoped by this means more effectively and economically to regulate the size of the Reserve in accordance with requirements from time to time.

Vote 1 shows a gross increase of £94,000 due principally to the increased number of airmen who will be entered for training and to miscellaneous increases in the civilians subhead. The net increase of £142,000 reflects not only the gross increase, but a diminished appropriation-in-aid in respect of Aden.

Training.

In 1930 for the first time the Armament and Gunnery School is giving an advanced course in armament for officers designed to fill posts requiring the highest degree of knowledge in this subject. A start has also been made with the training in torpedo work of officers required for this duty in the flying boat and other squadrons allocated for coastwise defence. By the courtesy of the Admiralty this first course is being given in naval establishments.

Auxiliary and Reserve Forces.

The development of these forces has proceeded satisfactorily, the increase in the total of Vote 7 being accounted for chiefly by the expansion of cadre and Auxiliary Air Force squadrons. The strength of existing units has, generally speaking, been well maintained.

Supermarine Metal Monoplane Air Yacht

(THREE SIDDELEY GEARED JAGUARS)

Excellent results continue to be achieved by the University air squadrons at Oxford and Cambridge, and the fact that solo flying in term-time is now permitted to members of these squadrons at both Universities has had the beneficial effect of enabling tuition in flying to be maintained without a break both in and out of term. Both squadrons have been maintained at full strength since their formation, and it is estimated that, on an average, each vacancy is applied for twice over.

Technical Equipment.

Vote 3 (technical and warlike equipment) shows an increase of £642,000. This increase is principally due to provision of equipment for units formed in 1929, to the continued replacement of obsolescent types, and to an improvement of the position in regard to working stocks of equipment, which have been in danger of running too low for full flying efficiency.

The provision and use of parachutes at home and overseas is now universal, with the exceptions stated below, and experience has further demonstrated their value as a protection to the flying personnel. Parachutes cannot be carried in certain obsolescent types, which are in process of replacement, and their provision for sea-going aircraft depends upon the design of a quick release to enable the wearer instantly to disengage the parachute if he is still in his machine when it falls into the water: various designs to meet this requirement have been under careful investigation for some time, and it is hoped, in the light of recent trials, that a satisfactory type has now been evolved. Nineteen lives were saved by the use of parachutes during the past year.

By the autumn of 1930 forty-three regular squadrons at home and abroad, one cadre squadron and five auxiliary squadrons, should be equipped with slotted wing aircraft. These units represent about half of the types (and much more than half the number) of aircraft in use by the Royal Air Force; the remainder include certain aircraft of obsolescent design and the fighter and flying boat classes. Experiments are now being made with the fitting of slotted wings to both these latter.

Provision has been made for completing the replacement of the lighter types of motor transport, which was begun in 1928, and for continuing the replacement of obsolete heavy vehicles by six-wheeled types.

Additional provision has been made for torpedoes owing to the increasing amount of training carried out with this weapon.

The larger horse power of engines now in use and the increasing amount of flying carried out lead to a corresponding increase in the consumption of petrol. Provision for lubricating oil is reduced as the result of the extended use of mineral oil which is considerably less expensive than castor oil.

Research and Technical Development.

The cost of research and technical development is shown in detail in Appendix 1 of the Estimates. The increase of £17,000 net over last year is attributable to the provision for new constructional work at the Royal Aircraft Establishment, Farnborough, apart from which other items would have shown a net decrease.

The Royal Aircraft Establishment was laid out during the war period when the demands upon it were very different from those now prevailing. The shrinkage of work after the war enabled certain buildings to be eliminated,

but this process is not an economical means of dealing with the needs of a research and experimental establishment to-day. Present requirements have therefore been carefully investigated in accordance with the latest methods of factory organization, and as a result it has been shown that the expenditure of a capital sum upon regrouping the component workshops and renewing certain of the buildings will effect a considerable economy in time and labour. £41,500 has been provided for this reorganization in 1930.

Provision is also included for commencing the construction of a large wind tunnel capable of containing the fuselage, engine and airscrew of an aeroplane at full scale. This will enable certain work to be carried out, such as the determination of the most efficient engine cowling and airscrew dimensions, which cannot be performed in any other way; and it will also permit accurate measurement of the air resistance of actual aeroplanes, under laboratory conditions, instead of by repeated flights in the air, with a large economy of time and effort.

The variable density wind tunnel at the National Physical Laboratory which was put in hand in 1929, is expected to be completed and running during the coming year.

The programme of new aircraft comprises eight experimental types, service and civil.

The investigations of the Aeronautical Research Committee into the problems of noise in aircraft have reached a stage at which the volume of sound has been accurately computed; and its chief sources, the engine and the tip of the airscrew at high speeds, are now being attacked simultaneously with an investigation of the best design and materials for cabin construction from the standpoint of sound insulation.

As an example of the progress made in engine design, it is interesting to observe that the Rolls-Royce engine with which the Schneider Trophy was won developed 1,900 h.p. for a weight of 1,526 lbs. (.8 lb. per horse-power), whereas the engine of the winning machine in the 1927 contest developed 900 h.p. for a weight of 928 lbs. (1.03 lbs. per horse-power).

Airships.

The two airships, R100 and R101, were both completed in the autumn of 1929. R101, which was built at the Royal Airship Works, was brought out of her shed at Cardington in October, and carried out her first trial flights in that month. During November she remained at the mooring mast when not in flight, and rode through some very heavy weather without damage or strain.

R100 was brought out of the Airship Guarantee Company's shed at Howden and flown to Cardington in the middle of December. After a second short flight she was transferred to No. 2 shed at Cardington for some minor modifications. In the latter part of January she carried out several flights, concluding with one of nearly fifty-four hours, during which she flew over and round the whole of southern England and the adjacent seas.

It may be of interest to compare what has been done up to date with the programme laid down in 1924. The object of that programme was to build two airships of nearly double the size of any airship hitherto constructed in this country, with a much higher standard of passenger accommodation than had ever been attempted before, and with designs which were to be based strictly on the results of scientific investigations and were to comply with definite and exacting safety requirements. It was also proposed that

both airships should, as the last stage in their trials, carry out an extended voyage, for example, a flight to India and back via Egypt. The trials of R100 and R101 have shown that a satisfactory measure of success has been achieved, despite delays inevitable in a field so novel and experimental. Both airships have proved to be thoroughly stable and easy to control. R101 rode at the mast through weather of exceptional severity (including gales with gusts up to 83 miles per hour) for a month on end, whilst R100 has attained a full speed of about 81 miles per hour, which is as high as that of the Graf Zeppelin, an airship of much smaller diameter. On the other hand, owing to the unexpected difficulties met with in the development of the heavy oil engine, R100 has had to be equipped with petrol engines, and is, therefore, not suitable for navigation in the tropics. R101 is equipped with the first engine operating on the compression ignition system with heavy oil which has ever been used as a power unit in aircraft in this country; but owing to difficulties in the development of a variable-pitch airscrew, one of the airship's five engines has to be reserved for going astern, whilst the weight of the power system as a whole is, and must for the time being, remain considerably higher than was estimated. Moreover, as has been explained to Parliament from time to time, lift has been deliberately sacrificed in order to incorporate certain other experimental features in this airship. The result has been that her useful load fell below that originally proposed. It has, therefore, been decided, in accordance with the policy of "safety first," which has been followed throughout, that an additional bay should be inserted in R101 before a flight to India and back is undertaken, even though such a flight might well have been carried through successfully without this addition.

Provision is accordingly made in these estimates for this alteration to R101, the construction of the necessary spares for both airships, and the carrying out of a programme of oversea flights between now and April, 1931. The intention is that R100 should in the late spring or summer carry out a flight or flights to the tower erected at Montreal by His Majesty's Government in Canada, and during the winter should operate between Cardington and Ismailia. R101 is to fly to India and back in the autumn, and will then be used for experimental operation on the Indian route. This is essential in order to obtain the data necessary before a commercial service on this route can be established.

Provision is also made for another important item, namely, the development of a mechanical means of moving large airships into and out of their sheds. It is very desirable, if airships are to be used for long distance services, that it should be possible for them to be moved in and out of their sheds as and when necessary without the large number of men required at present. In addition, a small sum is provided in order to avoid delay in meeting the possible requirements of the future, for further design work by the technical staffs both of the Airship Guarantee Company and of the Royal Airship Works, in which the experience already gained in the construction and trials of the two airships will be utilized.

The total provision for the above services is £345,000 net, viz.:—£354,000 on Vote 3, sub-heads N, and O less £9,000 for appropriations-in-aid on sub-head P.

Works.

The provision, both for major new works already in progress and for those appearing for the first time, is less than in 1929, the total decrease amounting

to £109,000. The expenditure on purchases of land and buildings will also be considerably lower.

Pending completion of the negotiations with Egypt, only such works are being proceeded with outside the Canal zone as cannot be dispensed with even temporarily. In the Sudan necessary additions are being made to the accommodation already available for the squadron stationed there. Provision is included for the completion of emergency works in Palestine in connection with the disturbances in that country; the cost of these will be met from the Colonial and Middle Eastern Services Vote.

The only new stations on which work is to be commenced are one for regular squadrons in East Anglia, one for a non-regular unit in Northumberland (both deferred from 1929), and one for a non-regular unit in Scotland in replacement of an unsuitable temporary station.

The overall deduction made in accordance with the practice of previous years to discount unforeseen delays has been put at £50,000. The net total of Vote 4 is £144,000 less than in 1929.

Civil Aviation.

The increase in the vote for civil aviation this year is mainly due to the provision for an additional net payment of £60,000 to Imperial Airways, Limited, in respect of the inauguration of the imperial air service to South Africa. The section of the service between Alexandria and Mwanza (Tanganyika) should commence in the autumn of 1930, and the through service to Cape Town in the spring of 1931.

£348,000 has been included for subsidies to Imperial Airways, Limited, in respect of their existing European services and of the service to Karachi. The latter service has now been extended to Delhi by the Government of India under arrangement with the Company.

The existing agreements with light aeroplane clubs will, with two exceptions, terminate in the course of this year. I am able to announce that further financial assistance will be afforded to these clubs on precisely the same scale as that given to National Flying Services, Limited. The amount required for payments to the clubs and to National Flying Services, Limited, is estimated at £20,000.

Provision is made for portable floodlights at five aerodromes in the Middle East and in the Persian Gulf in order to enable flights by night to be regularly undertaken on the England-India air route.

It is proposed to proceed during the year with levelling and improvement of the surface at Croydon aerodrome.

Meteorology.

The expenditure on meteorology (Vote 9) shows an increase of £11,500 on that for the previous year, allowance being made for an anticipated increase in receipts of £2,000.

Additional staff is required for the meteorological service in the Middle East to enable it to provide the more extended service of forecasts and reports made necessary by the establishment of the Indian air mail.

During the past few years there has been great difficulty in meeting the ever increasing demands for the services of trained meteorologists which arise from the development of aviation at home and abroad as well as from other causes. To meet these demands there is not available in the country

any source of supply outside the government service. It has therefore been decided to add six posts to the junior grade, where men who have taken the requisite university courses in physics or mathematics will receive systematic training in meteorology. There will thus be available a small reserve from which officers can be drawn to carry on responsible work arising from new developments.

A further increase arises from the establishment of a Port Meteorological Office in the London docks to deal more effectively with the requirements of observing ships based on that port. London ships already form a large proportion of the five hundred vessels that compose the fleet of voluntary observing ships, and it is anticipated that the proposals made in the International Convention for the Safety of Life at Sea will result in that proportion becoming still larger.

Air Ministry.

The rise in Vote 10 (Air Ministry) is due in the main to annual increments of pay on approved scales and to increased provision required for cost of living bonus.

A measure of reorganization has been carried out in the department of the Air Member for Personnel. The work in connection with the posting of officers of the Royal Air Force and their selection for specialist courses and the maintenance of the appropriate strengths in numbers, ranks and qualifications at the various units has been growing in volume and intricacy with the expansion of the Force, and the staff dealing with these matters has had to be strengthened in order to cope with it.

The retirement from the post of Chief of the Air Staff, on January 1st last, of Marshal of the Royal Air Force Lord Trenchard marks the conclusion of twelve years of independent existence of the Force. Since 1912, when he joined the then Royal Flying Corps, Lord Trenchard has devoted himself to the Air Service with a single-mindedness of purpose which deserves, and has received, the recognition not only of the Force which he has brought to so high a pitch of efficiency, and of the successive governments which he has loyally served, but of the country as a whole. The Royal Air Force will always remember the inspiration and guidance which it received from him during the difficulties of its early years.

THOMSON.

Air Ministry,
March 4th, 1930.

ABSTRACT OF AIR ESTIMATES, 1930.

—	Estimates, 1930.			Estimates, 1929, including Supplementary Estimate.			Differences on Net Estimates.
	Gross Estimate.	Appropriations in Aid.	Net Estimate.	Gross Estimate.	Appropriations in Aid.	Net Estimate.	Increase or Decrease.
			Total Numbers.			Total Numbers.	Numbers.
I.—NUMBERS.							
Maximum number of Officers, Cadets, Warrant Officers, Non-Commissioned Officers, Aircraftmen and Apprentices to be borne on the Establishment of the Royal Air Force or attached thereto, exclusive of those serving in India (other than Aden)...	—	—	32,000	—	—	32,000	—
II.—EFFECTIVE SERVICES.	£	£	£	£	£	£	£
Pay, etc., of the Air Force	4,449,000	718,000	3,731,000	4,355,000	766,000	3,589,000	+ 142,000
Quartering, Stores (except technical), Supplies and Transport	1,864,000	129,000	1,735,000	1,808,000	132,000	1,676,000	+ 59,000
Technical and Warlike Stores (including Experimental and Research Services) ...	9,496,000*	1,900,000	7,596,000	8,799,000	1,845,000	6,954,000	+ 642,000
Works, Buildings and Lands...	1,923,000	203,000	1,720,000	2,083,000	219,000	1,864,000	− 144,000
Medical Services	318,000	20,000	298,000	316,500	10,500	306,000	− 8,000
Educational Services	502,000	9,000	493,000	508,000	10,000	498,000	− 5,000
Auxiliary and Reserve Forces	591,300	300	591,000	556,100	100	556,000	+ 35,000
Civil Aviation	547,000*	47,000	500,000	441,000	30,000	411,000	+ 89,000
Meteorological and Miscellaneous Effective Services	269,000*	24,000	245,000	250,000	22,000	228,000	+ 17,000
Air Ministry	678,000	3,000	675,000	663,000	2,000	661,000	+ 14,000
Total Effective Services	20,637,300	3,053,300	17,584,000	19,779,600	3,036,600	16,743,000	
III.—NON-EFFECTIVE SERVICES.							
Half-pay, Pensions and other Non-Effective Services	286,500†	20,500	266,000	233,500	16,500	217,000	+ 49,000
Total Effective and Non-Effective Services	20,923,800	3,073,800	17,850,000	20,013,100	3,053,100	16,960,000‡	+ 890,000

* Includes certain non-effective charges in respect of this service.

† Excludes certain non-effective charges in respect of Meteorological Services which are included under Vote 9, of Civil Aviation included under Vote 8, and of the Royal Aircraft Establishment, Farnborough, and Royal Airship Works, Cardington, included under Vote 3.

‡ Totals, Original Net Estimate, 1929 ... ... £16,200,000
Add—Supplementary Estimate (H.C.80 of 1929-30) 760,000

£16,960,000

ROYAL AUSTRALIAN AIR FORCE

THE KING.

Governor-General and Commander-in-Chief:

His Excellency the Right Hon. John Lawrence Baron Stonehaven, P.C., G.C.M.G., D.S.O.

Honorary Group Captain:

(Group Captain, R.A.F.) His Royal Highness Albert Frederick Arthur George, Duke of York, K.G., P.C., K.T., G.C.M.G., G.C.V.O. (Personal A.D.C. to H.M. the King).

Air Aide-de-Camp to the Governor-General:

Wing Commander R. S. Brown, A.F.C., *p.s.a.*
Wing Commander L. J. Wackett, D.F.C., A.F.C., B.Sc., A.F.R.Ae.S., M.I.Ae.S. (Hons.).
Squadron Leader R. J. Brownell, M.C., M.M.

THE DEPARTMENT OF DEFENCE.

Minister of State for Defence.

Secretary:

M. L. Shepherd, Esq., I.S.O.

Council of Defence:

Air Force Member	Air Commodore R. Williams, C.B.E., D.S.O., *p.s.a.*

Air Board:

First Air Member	Air Commodore R. Williams, C.B.E., D.S.O., *p.s.a.*, Chief of the Air Staff.
Second Air Member	Group Captain S. J. Goble, C.B.E., D.S.O., D.S.C., *p.s.a.*, Air Member for Personnel.
Air Member for Supply	Wing Commander W. H. Anderson, D.F.C., *p.s.a.*
Finance Member	A. C. Joyce, Esq., A.I.C.A.
Secretary	P. E. Coleman, Esq., O.B.E.

AIR FORCE HEADQUARTERS.

Branch of the Chief of the Air Staff:

Chief of the Air Staff	Air Commodore R. Williams, C.B.E., D.S.O., *p.s.a.*
Director of Operations and Intelligence	Squadron Leader T. F. W. Thompson, D.F.C., *p.s.a.*, R.A.F.
Director of Organization and Staff Duties	Squadron Leader H. N. Wrigley, D.F.C., A.F.C. *p.s.a.*
Director of Air Force Works and Buildings	Squadron Leader A. Hepburn, D.F.C., C.E., A.M.I.E.

Branch of the Air Member for Personnel:

Air Member for Personnel ...	Group Captain S. J. Goble, C.B.E., D.S.O., D.S.C., *p.s.a.*
Director of Training	Squadron Leader W. D. Bostock, *p.s.a.*
Director of Personnel Services ...	Squadron Leader R. J. Brownell, M.C., M.M., A.D.C.
Director of Manning	Flight Lieutenant C. C. Eaton.
Director of Air Force Medical Services	Wing Commander A. P. Lawrence, M.C., M.B., B.S., F.R.C.S. (Edin.), D.O.M.S. (Lon.).

Branch of the Air Member for Supply:

Air Member for Supply	Wing Commander W. H. Anderson, D.F.C., *p.s.a.*

LIAISON OFFICE, LONDON.

Liaison Officer	Flight Lieutenant W. Palstra, M.C., B.A., *p.s.a.*
Assistant Liaison Officer ...	Flight Lieutenant C. J. Harman.

NO. 1 FLYING TRAINING SCHOOL.

Point Cook, Victoria.

Commanding Officer	Wing Commander R. S. Brown, A.F.C., *p.s.a.*, A.D.C.

NO. 1 AIRCRAFT DEPOT.

Laverton, Victoria.

Commanding Officer	Wing Commander A. T. Cole, M.C., D.F.C., *p.s.a.*

NO. 1 SQUADRON.

Laverton, Victoria.

Commanding Officer	Squadron Leader F. W. F. Lukis.

NO. 3 SQUADRON.

Richmond, New South Wales.

Commanding Officer	Squadron Leader A. H. Cobby, D.S.O., D.F.C., *p.s.a.*

NO 101 FLIGHT.

Embarked in H.M.A.S. *Albatross*.

Commanding Officer	Squadron Leader V. R. Scriven, A.F.C., R.A.F.

PERSONNEL.

(*a*) The Governor-General in Council has approved of the appointment of Wing Commander W. H. Anderson, D.F.C., *p.s.a.*, as Air Member for Supply on the Air Board as from October 1st, 1929.

(*Note.*—By this appointment the personnel of the Air Board includes an Air Member for Supply for the first time.)

(*b*) The following R.A.F. officers who have been with the R.A.A.F. have returned to England on termination of their period of duty in Australia:—

Group Captain M. Spicer, Wing Commander H. G. Smart, O.B.E., D.F.C., A.F.C., Squadron Leader R. M. Drummond, D.S.O., O.B.E., M.C., *p.s.a.*, Squadron Leader G. G. Dawson.

(*c*) The following R.A.A.F. officers arrived in England in January, 1930, and are attending the 8th Course of the R.A.F. Staff College, Andover:—

Flight Lieutenants F. M. Bladin and D. E. L. Wilson.

Flying Training.

On December 16th, two short *ab initio* flying training courses were commenced, one at No. 1 Squadron and one at No. 3 Squadron. The course comprises nine pupils at No. 1 Squadron and eight pupils at No. 3 Squadron. Successful graduates from these courses will be granted commissions in the Citizen Air Force. The inauguration of these courses follows recommendations by Air Chief-Marshal Sir John Salmond in regard to the training of officers for the Citizen Air Force.

Compulsory Training.

The Government has suspended the compulsory clauses of the Defence Act, and all trainees have been discharged from their attestation under the compulsory provisions of the Act. The policy of the Government is to fill the Citizen Force establishments of the Navy, Army and Air Force with voluntary personnel.

The establishments of the Navy and Army Citizen Forces were slightly reduced, but Citizen Force establishments of the Air Force remain approximately the same.

All the officers and about 75 per cent. of the other ranks of Nos. 1 and 3 Squadrons re-enlisted as volunteers, and it is anticipated that no trouble will be experienced in completing these units to their full strength with volunteers.

The period for which the volunteer airmen are being signed on in the Air Force is two years.

THE ROYAL CANADIAN AIR FORCE

Director of Air Services (Acting) Wing Commander L. S. Breadner, D.S.C., *p.s.a.*

R.C.A.F. Training Stations.

Camp Borden, Ontario:

Officer Commanding ... ... Wing Commander G. M. Croil, A.F.C., *p.s.a.*

Vancouver, British Columbia:

Officer Commanding ... ... Flight Lieutenant (temporary Squadron Leader) E. L. McLeod.

R.C.A.F. Communication Flight, Ottawa:

Officer in Charge ... ... (Attached to Ottawa Air Station).

Civil Government Air Operations.

Director ... ... Group Captain J. L. Gordon, D.F.C., A.D.C., *p.s.a.*

Stations :

Winnipeg Air Station, Manitoba :

Officer Commanding ... ... Squadron Leader N. R. Anderson, *p.s.a.*

High River Air Station, Alta. :

Officer Commanding ... ... Flight Lieutenant (Temporary Squadron Leader) A. A. Leitch, M.C., D.F.C.

Ottawa Air Station, Ontario :

Officer Commanding ... ... Flight Lieutenant (temporary Squadron Leader) R. S. Grandy.

Dartmouth Air Station, Nova Scotia :

Officer Commanding ... ...

No. 1 Depot, Ottawa, Ontario :

Officer Commanding ... ... Wing Commander W. R. Kenny, D.F.C., *q.s.*

Photographic Section, Ottawa, Ontario :

Officer Commanding ... ... Flight Lieutenant E. R. Owen.

AERONAUTICAL ENGINEERING.

Chief Aeronautical Engineer ... Group Captain E. W. Stedman, O.B.E.

LIAISON OFFICE, AIR MINISTRY, LONDON.

Liaison Officer ... ... Squadron Leader A. B. Shearer.

APPOINTMENTS.

The undermentioned officers are on interchange duties with the R.A.F. :—

Squadron Leader D. C. M. Hume.
Flight Lieut. H. W. Hewson.
Flight Lieut. A. H. Hull.
Flying Officer R. A. London.

Their period of duty with the R.A.F. terminates March, 1931.

Squadron Leader C. M. McEwen, M.C., D.F.C., and Flight Lieut. G. R. Howsam, M.C., arrived in England early in January, and are now attending the 8th Course at the Royal Air Force Staff College.

Flight Lieut. L. F. Stevenson, after a period of attachment to the Navy, is now attending the Royal Naval Staff College Course at Greenwich.

Flying Officer A. L. James is attending an Aeronautical Engineering Course at the Imperial College of Science and Technology, South Kensington.

Flight Lieut. A. L. Morfee and Flying Officer C. R. Slemon arrived in England in January to attend an Air Pilotage Course.

Flying Officer W. W. Brown arrived from Canada early in February to attend a Flying Instruction Course at the Central Flying School, Wittering.

Obituary

LIEUT.-COLONEL W. G. BARKER, V.C.

(*Extracts from the obituary notice which appeared in "The Times," March 13th.*)

Lieut.-Colonel William George Barker, V.C., the Canadian airman who was officially credited with bringing down fifty-two enemy aeroplanes in the war, was killed in a flying accident at Ottawa on March 12th at the age of thirty-five.

Born on November 3rd, 1894, at Dauphin, Manitoba, the son of Mr. G. W. J. Barker, of Winnipeg, Lieut.-Colonel Barker was educated at Dauphin College, and joined the Army on November 1st, 1914, going overseas with the 1st Canadian Mounted Rifles. He served in France till December, 1915, and was then transferred to the R.F.C. and served in it and the R.A.F. till the Armistice. He received the Military Cross for contact patrol at the capture of Beaumont Hamel on November 20th, 1916. At the capture of Bullecourt he obtained a bar to the Military Cross, April 9th, 1917, again for contact patrol. For destroying enemy aircraft in 1918 he received the D.S.O., January 5th, a second bar to the M.C., April 24th, and a bar to the D.S.O., July 20th; also the French Croix de Guerre for destroying enemy aircraft on the French front, May 26th; and the Italian silver medal for valour for destroying aircraft on the Italian front.

This record was crowned by the award of the Victoria Cross, for an epic fight, thus described in the *London Gazette* :—

On the morning of October 27th, 1918, this officer observed an enemy two-seater over the Forêt de Mormal. He attacked this machine and, after a short burst, it broke up in the air. At the same time a Fokker biplane attacked him, and he was wounded in the right thigh, but managed, despite this, to shoot down the enemy aeroplane in flames. He then found himself in the middle of a large formation of Fokkers, who attacked him from all directions, and was again severely wounded in the left thigh, but succeeded in driving down two of the enemy in a spin. He lost consciousness after this, and his machine fell out of control. On recovery, he found himself being attacked heavily by a large formation, and, singling out one machine, he deliberately charged and drove it down in flames.

During this fight his left elbow was shattered and he again fainted, and on regaining consciousness he found himself still being attacked, but, notwithstanding that he was now severely wounded in both legs and his left arm shattered, he dived on the nearest machine and shot it down in flames. Being greatly exhausted, he dived out of the fight to regain our lines, but was met by another formation, which attacked and endeavoured to cut him off, but after a hard fight he succeeded in breaking up this formation and reached our lines, where he crashed on landing.

This combat, in which Major Barker destroyed four enemy machines (three of them in flames), brought his total successes up to fifty enemy machines destroyed, and is a notable example of the exceptional bravery and disregard of danger which this very gallant officer has always displayed throughout his distinguished career.

The total number of machines known to have been brought down by Barker was ultimately settled officially as fifty-two. After the Armistice he became vice-president of the Fairchild Aircraft Corporation. In 1919, flying a Fokker aeroplane captured from the Germans, he completed the circuit in the Aerial Derby from Toronto to New York and back. His left arm was partly frozen in this flight. He was appointed hon. A.D.C. to Lord Byng, the Governor-General, in 1923, and in 1924 was made acting director of the Royal Canadian Air Force. At his death he was president of the Lynedoch Tobacco Company and vice-President of the Middleton Tobacco Company and of Norfolk Tobacco Plantations. He was an excellent horseman, and was fond of tennis, squash rackets and golf, and was president of the Maple Leaf Hockey Club, Toronto. He married, in 1921, Jean Kilbourn Smith, and had one daughter.

SOUTH AFRICAN AIR FORCE

AIR DIRECTORATE.

Headquarters ... ... Roberts' Heights, Pretoria.
Director of Air Services ... Colonel Sir H. A. van Ryneveld, K.B.E., D.S.O., M.C. S.A. Staff Corps.
Staff Officer ... ... Lieut.-Colonel K. R. van der Spuy, M.C., S.A.A.F. (Attached S.A. Staff Corps).
Staff Officer (Air Equipment) ... Lieut.-Colonel F. R. G. Hoare, C.B.E., S.A.O.C. (Attached S.A. Staff Corps).

NO. 1 FLYING TRAINING SCHOOL.

Headquarters ... ... Zwartkop Air Station, Pretoria.

NO. 1 SQUADRON.

Headquarters ... ... Zwartkop Air Station, Pretoria.

AIRCRAFT DEPOT.

Headquarters ... ... Roberts' Heights, Pretoria.
Officer Commanding ... ... Major J. Holthouse, O.B.E., S.A.A.F.
Adjutant ... ... Lieutenant N. C. P. Mostert, S.A.A.F.

RESERVE AEROPLANE PARK.

Headquarters ... ... Roberts' Heights, Pretoria.

TRANSVAAL UNIVERSITY COLLEGE AIR SQUADRON (ACTIVE CITIZEN FORCE).

Headquarters ... ... Pretoria.

NEW ZEALAND AIR FORCE

G.H.Q., WELLINGTON.

Director of Air Services ... Wing Commander S. Grant-Dalton, D.S.O., A.F.C.

N.Z.A.F. BASE, AUCKLAND.

Officer Commanding ... ... Major L. M. Isitt.
Instructor ... ... Captain S. Wallingford.

WIGRAM AERODROME, CHRISTCHURCH.

Officer Commanding ... ... Captain M. W. Buckley.
Instructor ... ... Captain H. B. Burrell.
Equipment Officer ... ... Lieutenant T. J. Denton.

DUTY WITH ROYAL AIR FORCE.

Dominion Liaison Officer ... Major T. M. Wilkes, M.C., Air Ministry, London.
Undergoing Courses ... ... Major J. L. Findlay, M.C.

NOTES ON AIR SERVICES IN CANADA

Summary of Civil Aviation Certificates and Licenses.

During the quarterly period, October 1st to December 31st, 1929, there have been issued 34 private pilots' licenses, 8 commercial pilots' licenses, and 9 air engineers' licenses; 7 aircraft have been registered and 8 air harbours licensed, bringing the total in force at December 21st, 1929, as follows:—

341 Private Pilots.	334 Commercial Pilots.
305 Air Engineers.	409 Aircraft.
68 Air Harbours.	

Air Mails of Canada.

The following is a summary of mails carried by air during the quarter ending December 31st, 1929, over the various air-mail routes in operation in Canada:—

Montreal—Detroit	7,865 lbs.
Montreal—Albany	5,166 „
Cranberry Portage—Kississing	6,775 „
Sioux Lookout—Narrows Lake	20,830 „
Toronto—Buffalo	10,134 „
Montreal—Rimouski	15,085
Lac du Bonnet—Wadhope—Bissot	329 „
Ottawa—Montreal	566 „
Montreal—Saint John	1,119 „
Leamington—Pelee Island	4,500 „
Fort McMurray—Aklavik	10,153 „
Quebec—Seven Islands	3,693 „
Seven Islands—Anticosti	635 „
Oskelanco—Chebougamou	313 „

The total weight of mails carried over all routes during the quarter was 87,163 lbs. and the total weight for 1929 was 435,163 lbs.

The first air mail was carried on Fort McMurray to Aklavik route on November 26th, 1929, and was quite successful. Three aircraft carried 120,000 letters, approximately 4,000 lbs., to the North. Approximately four days were occupied in making the trip, due to intermediate stops and to the fact that only about two and a half hours' daily flying is possible in the far North.

The Montreal to Saint John route is an experimental service which was commenced on December 9th, 1929, the route being via Quebec, South shore, St. Lawrence River, thence to Edmundston, Saint John River Valley, to a point north-east of Woodstock, thence to Fredericton, Moncton, Saint John. All Trans-Atlantic mail is delivered at Moncton and conveyed to Halifax by train service to connect with the ocean liners.

The gain in delivery between Montreal and Saint John is eighteen hours, and between Montreal and Halifax twenty-four hours.

The postage rates for this service are 5 cents for the first ounce and 10 cents for each succeeding ounce or fraction. Special delivery fees and registered letters are in addition to these rates.

Light Aeroplane Clubs of Canada.

Twenty-two clubs are now actively engaged in flying instruction. All the clubs show an increase in membership which, on December 31st, 1929, was 5,095.

The operations of clubs during the twelve months ending December 31st, 1929, are as follows :—

Club.	Flying Time. hrs.	Flying Time. min.	Ab Initio Soloists.	Licenses Obtained Private.	Licenses Obtained Commercial
Cape Breton, N.S.	216	12	6	—	—
Saint John, N.B.	317	15	11	3	—
Halifax, N.S.	292	42	4	4	2
Granby, P.Q.	202	57	15	4	—
Montreal, P.Q.	982	30	51	30	5
Ottawa, Ont.	1,282	45	14	29	15
Kingston, Ont.	167	20	4	—	—
Toronto, Ont.	1,514	35	40	16	12
Hamilton, Ont.	737	15	24	7	6
St. Catherines, Ont.	344	50	2	2	—
Brant and Norfolk, Ont.	209	35	4	—	—
London, Ont.	398	35	16	6	2
Border Cities, Ont.	992	45	25	9	5
Fort William, Ont.	558	45	7	5	—
Winnipeg, Man.	1,464	8	18	45	12
Regina, Sask.	1,157	30	38	23	7
Moose Jaw, Sask.	654	35	27	18	6
Saskatoon, Sask.	1,156	20	35	27	3
Calgary, Alta.	1,254	10	43	31	12
Edmonton, Alta.	1,048	40	4	26	4
Brandon, Man.	122	43	1	—	—
Victoria, B.C.	34	10	11	—	—
Vancouver, B.C.	627	5	11	8	3
Total	15,736	45	411	293	97

St. Hubert Airport and Airship Base.

This air base, which has recently been completed, is most up-to-date for the reception of international air traffic both for aircraft and airships.

The following shows the amount of international activities for two months during October and November of 1929 :—

Canadian Planes *In.*	*Canadian Planes* *Out.*	*Foreign Planes* *In.*	*Foreign Planes* *Out.*	*Passengers* *In.*	*Passengers* *Out.*	*Baggage Examined*	*Mail (Bags)* *In.*	*Mail (Bags)* *Out.*
28	29	74	115	198	224	139	1,085	364

Number and value of aircraft and parts imported : 9—74,387 dollars.

Directorate of Civil Government Air Operations.

To give an idea of the activities of this branch, the following summary is given, covering a period from April 1st, 1929, to January 23rd, 1930 :—

High River Air Station.

Total forestry fire patrols : 1,293 hrs. 45 min.

Army co-operation, investigation, reconnaissance and transportation flying : 37 hrs. 05 min.

Total flying time : 1,349 hrs. 10 min.

Winnipeg Air Station.

Total forestry fire patrols: 4,342 hrs. 52 min.

Transportation, Indian Treaty payment flights, photography, crop dusting, air route investigation and miscellaneous flying: 1,087 hrs. 50 min.

Total flying time: 5,600 hrs. 02 min.

Ottawa Air Station.

Forest dusting, photography, type tests, air route investigation and transportation. Total flying time: 1,414 hrs. 01 min.

Photographic Detachments.

Eight operated in various parts of the country. Total flying time: 3,243 hrs. 21 min.

SUMMARY OF ACTIVITIES FOR TEN MONTHS.

	hrs.	*min.*
Air Stations	8,363	13
Photographic Detachments	3,243	21
Total	11,606	34

AVIATION IN FOREIGN COUNTRIES

FRANCE.

The development of the Air Ministry Organization continues. The Budget for 1930 Air Expenditure has passed the Chamber of Deputies without any important modifications. The debate was remarkable for the smallness of the number of deputies who attended, the early stages being carried through before an attendance sometimes as low as thirty. During the course of the debate the Air Minister, in answer to mild criticism from the Left, pointed out that the Air Ministry had only been in existence for just over a year and that it was too early to expect him to produce any great results. He outlined the work that had been done to improve technique in both civil and military aviation, and restated his policy of concentrating civil aircraft firms into three or four big companies to control everything from the production of aircraft material to the operation of Air routes. The Air Minister also restated his policy of dispersing the existing concentrating of aircraft firms from the neighbourhood of Paris.

The amalgamation of the Military and Naval Air Services to form an Air Force is proceeding slowly. The necessary laws have been drafted and will be discussed in the Chamber during the coming summer. In the meantime a working agreement has been drawn up and is being acted upon.

Colonial aviation is receiving considerable attention. Preparations are being made to open an air line across the Sahara to the Congo during 1930. It is hoped to extend this line to Madagascar during 1931. The Air Forces in West Africa will be increased to two squadrons before the end of the

year and a squadron will be added in Central Africa in 1931. In Madagascar ground parties are at work preparing for a squadron which will arrive there during this year.

The French air line to the East will, as soon as possible, work in co-operation with Imperial Airways and will deliver the French mail to Baghdad. From there Imperial Airways will carry it on to Rangoon, where it will be transferred to a French line for conveyance to Indo China.

With regard to the production of new aircraft, the Air Ministry now pays for the construction of approved prototypes. After these have been produced and tested the Air Minister has the right to order their production in series by any firm he pleases. According to his statement in the Chamber recently about eighty new types of aircraft are due to be tested during 1930. About half of these are military types mostly of metal construction.

GERMANY.

Government Subsidies.

During the coming financial year, the policy of the German Government will be to grant subsidies to the four following firms only :—

Junkers Flugzeugwerke A.G., Dessau.
Dornier Metallbauten G.m.b.H., Friedrichshafen.
Heinkel Flugzeugwerke G.m.b.H., Warnemunde.
Bayerische Flugzeugwerke A.G., Augsburg.

These firms will receive orders from the subsidised organizations—*i.e.*, The Deutsche Luft Hansa (German Air Traffic Concern), Deutscher Verkehrsfliegerschule (German Flying School for Commercial Pilots), and the Deutscher Versuchsanstalt für Luftfahrt (German Aeronautical Experimental Establishment).

The result of withholding subsidies from the smaller aircraft firms may result in some of them being compelled to go into liquidation, and already as the result of lack of Government support one or two firms are said to be in financial difficulties.

ITALY.

Air Estimates.

(*Extract from " The Times," March 15th*, 1930.)

General Balbo, the Minister for Air, in his speech on the aviation estimates, made a plea for greater financial support. He dealt briefly with the progress of Italian civil aviation, and said that it was not intended to create any new air lines, but to intensify the traffic on those now existing.

Passing to military aviation, General Balbo declared that they had resolutely tackled the question of bombing machines, which constituted the basis of their aerial forces. So far as bombing at sea was concerned, the S55 had now proved so satisfactory that it would be the definite standard type for some years to come. As for bombardment on land, Italy would have machines with characteristics superior to those of machines of other European nations if they were granted the means to produce. The same was true also of their machines for chasing the enemy.

General Balbo then devoted much time to insisting that " an aeronautical conscience " must be created in Italy. Aviation was the terrible unknown

of the future war, and because of the technical progress made in it, it was essential to increase the Budget. General Balbo gave a number of figures showing the expenditure on aviation and other military forces in countries such as Great Britain and France. The total Italian aviation estimates were for an expenditure of 718,000,000 lire (nearly £8,000,000). "The example of our powerful neighbour (France) was to stimulate us finally to embark upon a policy of adjustment between the expenditure on aeronautics and the expenditure on other military objects." Italy was perhaps the most vulnerable country in Europe from the air, and could only be saved from ruin by a strong air force.

Competition, Touring Aircraft

The Aero Club of Italy is organizing a competition for touring aircraft to be held this year, which will consist of an air race round Italy.

Prizes amounting to 1,000,000 lire are being awarded, and the race will be divided into four stages, the total distance being about 1,500 miles :—

1st Stage	...	Rome—Naples—Foggia—Rimini.
2nd ,,	...	Rimini—Vicenza—Trieste—Venice.
3rd ,,	...	Venice—Trento—Turin.
4th ,,	...	Turin—Rome.

The full regulations for the race are to be published shortly.

A national exhibition of touring aircraft is to be held in May at the Littorio Aerodrome, Rome, and a similar international exhibition is to be held next year.

An agreement has been concluded with the Greek Government by the Italian Aero Expresso Company whereby an experimental service will shortly be put into operation between Athens and Rhodes, connecting with the Athens—Brindisi Line. There will be one outward and one homeward flight weekly to start with.

JAPAN.

The following is the achievement of the Japan Air Transport Company for the six months from the opening of business on April 1st, 1929, to September 30th, 1929 :—

Distance Flown (in 1,000 kms.).

Lap.	Scheduled.	Accomplished	Un-accomplished	Per cent. Accomplished
Tokyo—Osaka	266	200	66	75
Osaka—Fukuoka	157	124	33	79
Fukuoka—Ulsan	20	16	4	80
Ulsan—Seoul	48	35	13	74
Seoul—Dairen	94	61	33	65
Total ...	585	436	149	75
Osaka—Shangai Line—Osaka—Fukuoka ...	39	33	6	84
General Total ...	624	469	155	76

Thus, the total distance of accomplished flights is 75 per cent. of the total distance scheduled. The number of forced landings was 28, of which 16 were due to engine trouble and 12 to weather conditions. Almost all of these landings occurred with Salmsons, which were provisionally used for carrying mail. In the case of Fokker passenger-carriers, only one forced landing was made, and this for the purpose of inspecting the oil gauge on a flight between Tokyo and Osaka.

The number of passengers from Tokyo who were dealt with at the Tokyo branch from July 15th, when the transport of passengers was begun, to October 10th, was 460, of which 21 were foreigners and 27 women. The result in regard to passengers was as good as expected, but the amount of goods and mail matter carried was disappointing.

LATVIA.

Sqdn.-Ldr. D. Colyer, D.F.C., has been appointed Air Adviser to the Latvian General Staff and commenced his duties in January, 1930. It will be remembered that Flight-Lieut. A. C. Collier holds a similar appointment in Estonia.

POLAND.

The following developments in military and civil aviation took place during 1929 :—

(*a*) The establishment of an Under-Secretariat for Air under the Ministry of War. This new Under-Secretariat has taken over the administration of both military and civil aviation.
(*b*) Continued development of the national aircraft and aero-engine industry with a view to becoming independent of foreign supplies.
(*c*) Continued reorganization of the Air Force.
(*d*) The amalgamation of all civil air traffic companies into one national air traffic company, called " Lot."

UNITED STATES.

U.S. Army Air Corps Winter Manœuvres, 1930.

The 1st Pursuit Group of the U.S. Army Air Corps carried out winter manœuvres during the period January 8th to 29th. The personnel consisted of 23 pilots and 20 mechanics. The aircraft, which included 18 fighters, 3 transport (troop carriers), and 1 standard reconnaissance, were fitted with skis in place of the usual undercarriage. Throughout the manœuvres the group covered a total distance of 3,500 miles under most severe weather conditions.

The object of the manœuvres was twofold :—

(*a*) To test efficiency of personnel and material (for maintenance purposes mechanics were carried in the transports).
(*b*) To obtain experience with and test the value of short-wave W/T in aircraft operating in remote regions.

Throughout the flight weather conditions were extremely difficult, the temperature at times registering 32° below zero, in addition to which fog and heavy snowstorms were encountered. A few forced landings were

experienced but, with the exception of one "write-off" only minor mishaps occurred to the aircraft which were repaired by the personnel. During the earlier part of the manœuvres some difficulty was experienced by the Flight in starting their engines in the early mornings and "plumbers' fire pots" and, when available, steam heating appliances were resorted to, the former proving particularly effective. Much useful information was obtained on the changing of engines and cylinders under arctic conditions, these being necessary owing to seized engines and broken connecting rods.

Regarding personnel; several members were treated for frostbite and pilots found it necessary to fly without goggles owing to continued freezing over of the lenses.

Air Corps Manœuvres in Panama Canal Zone.

According to a recent press report the U.S. Army Air Corps intends to carry out a rather ambitious scheme in connection with the spring manœuvres. A total of 116 aircraft are to proceed from four points in the United States via the various Republics in Central America, where stops will be made *en route*. The starting points in the States are as follows :—

25 aircraft from	Coronado, California ...	Over 2,600	miles to Panama.		
24	,,	Langley Field, Virginia ...	,, 3,000	,,	,,
37	,,	Fort Crockett, Texas ...	,, 2,000	,,	,,
30	,,	Selfridge Field, Michigan	,, 3,000	,,	,,

The object of these manœuvres in connection with the defence of the Canal Zone, is to test the mobility and efficiency of Air Corps fighting and bombing units between the United States and Panama. It is understood that fleet aircraft will also take part in the operations, but numbers are unknown.

Naval aircraft have taken the major part in all combined manœuvres hitherto held in the Caribbean Sea and as far as the Panama Canal Zone is concerned, have resulted in repeated recommendations for an increase in the defences, particularly air. The existing defence forces are said to be totally inadequate.

A system of well-established air routes now links up the several Republics lying between the States and Panama, and although the scheme outlined above appears to be somewhat ambitious, there is no reason why these long concentration flights should not be successfully carried through with the facilities that will be available.

U.S. Civil Aviation Statistics.

DEPARTMENT OF COMMERCE.

Licences issued up to December 16th, 1929.—The statistics issued by the Department of Commerce, relating to Civil Aviation in the United States, show that the following licences have been issued :—

Active pilot licences	9,472
Student permits	29,324
Mechanic licences	7,404
Aircraft licences	6,646
Aircraft identified (awaiting licence)	3,060

Airways in Operation.—As at December 15th, 1929, the following table gives details of United States Civil Airways :—

	Miles.
Mail airways in operation	26,597
Other airways in operation	9,368
Total airways in operation	35,965
Miles flown daily on mail airways	51.230
Miles flown daily on other airways	36,756
Total miles flown daily on all airways	87,986

Airway Statistics, period January to June, 1929.—The following summarizes activities on scheduled airways only, and does not include taxi flights, etc. :—

Miles flown	9,201,338
Passengers carried	52,473
Express matter carried (pounds)	976,219
Mail carried (pounds)	3,468,562

Airports.—The number of airports in the United States as listed by the Department of Commerce on December 1st, 1929, was as follows :—

Municipal airports	440
Commercial airports	465
Intermediate airports	278
Army Air Corps stations	70
Naval Air Service stations	14
Other Government air stations	2
Marked auxiliary fields	240
Total	1,509
Proposed airports, additional to above	1,278

AIRSHIP NOTES

GREAT BRITAIN.

The initial programme of home flight tests of the two new airships, R100 and R101, has now been satisfactorily accomplished, and the following is a brief summary of these operations :—

Flight Tests.

R101. Launched 12/10/29.

Date.	Duration.
14/10/29 ...	5 hrs. 41 min.
18/10/29 ...	9 „ 38 „
1/11/29 ...	7 „ 15 „
2-3/11/29 ...	14 „ 14 „
8/11/29 ...	3 „ 4 „
14/11/29 ...	3 „ 9 „
17-18/11/29 ...	30 „ 39 „
30/11/29 ...	Housed.
Total ...	73 hrs. 40 min.

R100. Launched 16/12/29.

Date.	Duration.
16/12/29 ...	5 hrs. 47 min.
17/12/29 ...	6 „ 29 „
16/1/30 ...	13 „ 36 „
20/1/30 ...	7 „ 18 „
27-29/1/30 ...	53 „ 52 „
30/1/30 ...	Housed.
Total ...	87 hrs. 2 min.

In the course of these operations, R101 was moored to the mooring-tower for a total period of 36 days and R100 for 12 days.

The present programme of airship development, which was inaugurated in 1924, aimed at the construction of airships of approximately twice the size of any previously built in this country, involving entirely new principles of design and fulfilling exacting requirements as to factors of safety, which would provide accommodation for 100 passengers, be capable of flying to India with one intermediate stop, and of mooring to a tower in winds up to 60 m.p.h. Arising out of the Imperial Conference of 1926, at which the Canadian Government undertook to erect a mooring tower at Montreal, the additional requirement of trans-Atlantic flight was imposed.

An appreciation of the result of the trials, and a statement as to the programme for the financial year 1930 are contained in the Memorandum by the Secretary of State for Air to accompany Air Estimates for 1930, which was recently published. (*See page* 378.)

BOOK REVIEWS

THREE ROWS OF TAPE. By A. TRYSTAN EDWARDS. (William Heinemann, Ltd. 167 pages. Price 6s. net.)

This little book, described as "a social study of the lower deck," was written by one who, after a public school and university education, joined the Navy during the war and rose to the rank of Able Seaman. Mr. Trystan Edwards is now an architect.

He describes life on the lower deck through his own intimate knowledge, but as seen through the eyes of an unprejudiced and articulate observer. Though no believer in war for war's sake, Mr. Edwards pays a graceful and well-deserved tribute to that great-hearted gentleman who is the British bluejacket. "If great factories, workshops and commercial concerns," he says in his concluding chapter, "would so organize themselves that all men engaged in them, whether as employers or employed, could acquire something of the spirit which prevails in the Navy, our industrial strife would soon be at an end." "Liberty, equality, and fraternity," he adds, "were flaming watchwords. Complete liberty and equality there can never be among men. The idea of fraternity is by far the most practical of the three, and it finds nowhere a greater measure of fulfilment than in the humane company of those who serve under the White Ensign." We can agree.

"It is unseemly that a man should say much about the Navy after but a few years' acquaintance with it," Mr. Edwards also writes in his Introduction. Mr. Edwards is too modest. His unassuming little volume has made us wish for more.

MEN O' WAR. By Captain TAPRELL DORLING, D.S.O., R.N. ("TAFFRAIL"). (Philip Allan. 308 pages. Price 15s. net.)

Captain Taprell Dorling has chosen a happy title for his latest book, for the five seamen whose characters and careers form the subject of his text were true men of war. Even Marryat saw much active service before he forsook the sword for the pen. First in this gallery of great captains is John Jervis, Earl of St. Vincent, fighting admiral, disciplinarian, and reformer. In many portraits, both contemporary and later, Jervis is pictured as a dour martinet, a master of his profession, but a man devoid of heart. Such portraits are unjust.

It may be that his early poverty and friendlessness in an era when the Royal Navy was a grim step-mother, tended to make him harsh and intolerant, outwardly at least; but here are cited instances of kindness and consideration for others which throw a new light on the admiral's character. With him, however, the interests of the Service were always paramount. Any officer who swerved a hairbreadth from the rigid line of duty was held to have sinned beyond redemption. How Jervis quelled an incipient mutiny in his fleet off Cadiz is an oft-told story. It was a

case for the iron hand, for England was beset with enemies, and the Fleet was, in simple truth, her all in all. Naval mutinies had occurred at Portsmouth and the Nore. Had the contagion been allowed to spread, the country might well have been left defenceless. But, thanks to his strong measures, Jervis's own fleet remained immune. When he hanged several mutineers on a Sunday before the assembled fleet, there was a great outcry. Yet even Nelson, who was loved as much as Jervis was feared, approved this act.

As First Lord of the Admiralty, Jervis did much to correct the abuses which were rife in the Navy itself and in the dockyards. His methods were always ruthless, sometimes even brutal, but there is no denying that the occasion demanded them. None can read his life as depicted in these pages without endorsing the eulogy pronounced after his death by a statesman who had known him well. It "was not saying too much that the Earl of St. Vincent ranked with the greatest of those illustrious characters to whom this country is indebted for its glory and renown."

The longest chapter in the book is devoted to Lord Cochrane, whose romantic career reads more like fiction than real life. As a fighting seaman, Cochrane had few equals. Some of his exploits in Mediterranean and South American waters would be incredible were they not fully authenticated. Unfortunately his peculiar temperament made him many enemies, and when he became implicated in a notorious Stock Exchange scandal it seemed as though a brilliant career was fated to end in disgrace. But, thanks in part to his own efforts, and in part to those of his devoted wife, his reputation was cleared. After his reinstatement, he was appointed, as a special mark of favour, Commander-in-Chief on the North America station, at the ripe age of 72. Few readers will find fault with the author's critical but sympathetic judgment on this outstanding personality.

Marryat, prince of sea novelists, Lord Fisher, and "Charlie" Beresford are the subjects of other essays, all of which show evidence of painstaking research. Within the compass of a single volume, Captain Dorling has given us a series of naval biographies which are authoritative, reasonably complete, and written in a most attractive style. This is a book which will be read and reread with unfailing entertainment.

(Reprinted from the *Daily Telegraph.*)

BRASSEY'S NAVAL AND SHIPPING ANNUAL, 1930. Edited by COMMANDER CHARLES N. ROBINSON, R.N., and H. M. ROSS. (William Clowes & Sons, Ltd. Price 25s. net.)

This most useful and interesting publication made its forty-first annual appearance, and most opportunely, on the eve of the Five-Power Conference in London for the Limitation of Naval Armaments. In the Naval Section, besides the usual chapters on the navies of the British Empire, foreign navies, and comparative strengths and distribution, written respectively by Commander C. N. Robinson, Captain E. Altham, R.N., and Mr. G. H. Hurford, Captain A. C. Dewar and Mr. Archibald Colbeck supply careful and well-documented essays on the Peace Treaty and After, from the naval point of view, and International Law and American Sentiment. Chapters on the French, Italian, and Spanish

Navies, written by officers of those services, follow. There are two other chapters on Modern Guns and their Development, and Marine Aviation. The latter, written by Major P. L. Holmes, D.S.C., late R.N.A.S. and R.A.F., should be of particular interest to readers of THE ROYAL AIR FORCE QUARTERLY. The Merchant Shipping Section is equally complete and informatively interesting, and Chapter XX, on Commercial Marine Aircraft, by Mr. C. G. Colebrook, will merit the attention of officers and others of the Royal Air Force. One of the most valuable portions of the book is the mass of statistical and tabular information at the end, which includes not only a list of every man-of-war, large and small, of every navy in the world, but lists of effective war vessels in tabular form, tables of naval guns and mountings, many statistics relating to the Mercantile Marines of this and other countries, and lists of steamship services and shipping associations. Well illustrated throughout, " Brassey " also has silhouettes and plans of British and foreign warships, and silhouettes of merchant vessels. The book is fully authoritative, the respective portions having been supplied or checked by the Admiralties, Government Departments, and the Naval Attachés of the various countries concerned, as well as by many shipbuilding and shipping companies. Supplying as it does a mass of accurate information in convenient form, this carefully compiled volume with its familiar blue cover should be in every Mess and Club as a valuable book of reference, as well as in the private possession of those who are interested in the Royal and Merchant Navies and matters pertaining thereto.

AROUND THE COASTS OF ARABIA. By AMEER RIHANI. 364 pp. and xi; 32 illus. (Constable & Co. Price 21s.)

Ameer Rihani has written a book on Arabia which is unusual in its outlook. After years of life in the United States, this distinguished Oriental scholar went to visit King Hussein. The Western mind in an Eastern body was able to see the inner sides of politics in the Hijaz as no other observer could. The aloofness of America from interests in the Arabian Peninsula enabled Hussein to open his heart.

Ameer Rihani is scrupulously fair in his account of the breakdown in relations with Great Britain which enabled Ibn Saóud to drive King Hussein from the holy city of Mecca. He gives an explanation of the causes of the failure to materialize of the Anglo-Arabian Treaty which seemed the natural aftermath of the war. These causes he considers largely personal. This is probably true. But the author also stresses the distance that stretches between the dream of a United Arabian Empire and its accomplishment. Had the Arabs the slightest tendency to cohesion, the crumbling Turkish Empire could not have held them in subjection up to 1914.

Two-fifths of the volume are devoted to King Hussein and the Hijaz. The author then describes in turn Asir, Kuweit, Bahrani, Aden and the protectorates. Ameer Rihani has written an equally brilliant book on that Puritan warrior of the desert, Ibn Saóud. The two volumes together, therefore, form a very complete handbook on the Arabian Peninsula.

Although each section contains a brief summary of the features of the

tribe or district concerned, there is nothing of the official handbook about his descriptions. The local colour is faithfully reproduced and interest renewed by quotations from the older Arabian writers.

The last section is of particular interest to R.A.F. officers. The author gives an account of the acquisition, in a very haphazard style, of Aden as a British fortified coaling station. The story of Aden's share in the war is given in full, and the unfortunate accidental death of our ally the Sultan of Lahaz recalled.

A brief account is given of the Protectorate with the amount of the subsidy paid to each. Now that Aden as well as the mandated territories are R.A.F. commands, the study of these inter-tribal politics becomes of practical interest.

H. E. H. T.

TURKEY AND SYRIA REBORN. By HAROLD ARMSTRONG. 270 pp.; 21 MSS. (The Bodley Head. Price 15s. net.)

Captain Armstrong, who described so fully the events in Turkey from 1918 to 1923 in his former volume, "Turkey in Travail," has renewed his acquaintance with Asia Minor. In 1927 he returned to Syria and Turkey as delegates of the Commission of Assessment of War Damage.

He describes, with a trained pen, his wanderings in these countries. But this volume is more than a travel story. It is a shrewd commentary on the political situation in Asia Minor of to-day, and turning backward for a moment throws a light on the movements that led up to them.

For example, his two pages of commentary on T. E. Lawrence are of particular value in shedding light on a page of Arabian history that reads like a film story. He describes him as an Englishman gone native (page 25, " . . . whose abnormalities had brought him into the limelight." And again, " Lawrence had lit a flame which was to singe the British and destroy the home of his friend the Sherif of Mecca.").

His account of his wanderings in Syria gives an impression of an interesting but insanitary tour. His work took him out of the beaten track. It is noted everywhere that his welcome was the reverse of cordial until his nationality was certified. France has not yet won the heart of Syria. The ways of a mandatory power are indeed hard.

The author's notes on the new Turkey are of a cautious nature. He describes Angora, the formless ugly new capital of the new Republic, and of the sorry exchange makes a parable. The Turks, he says, have withdrawn to Angora to avoid contact with the Western world which they detest. By doing so, they avoided the humiliations of capitulations and the other stigmata of defeat. They have also lost, as individuals, much comfort. The gaiety of Constantinople, the closer contact with the luxuries of modern civilization, have been abandoned that they may fit themselves for their proper rôle, that of a leading Eastern power. It appears to the author that the Turks, while shedding their religion, still hope to be the natural leaders of Islam. These views are interesting to those who have to do with the Middle East. A newborn Turkey, a discontented Syria, and, above all, the bait to European powers of ill-populated fertile lands, promise that the history of the next decade will radiate from events in Asia Minor.

H. E. H. T.

A History of Modern Times. By D. M. Ketelby, M.A. (Harrap. Price 8s. 6d.)

The author of this book is to be congratulated on a very fine achievement. Taking what is probably the most complicated period of world history—the years from 1789 to the present day—and assuming, quite rightly, that a book without some reference to the United States and the Far East would be an incomplete record of historical development during those momentous years, Miss Ketelby has sketched a fascinating picture which cannot fail to arrest the attention of the general reader and which, at the same time, will satisfy the needs of the serious student.

There is always the danger when compressing a vast historical subject into the narrow space of a short volume that the author will either rely upon facile generalizations or will be content to record a series of dull facts in bald narrative. Miss Ketelby successfully avoids this danger by careful selection of the essential details and by presenting them to the reader in a clear, concise, but very readable style of English. It is no disparagement of the worth of the book to say that it is the literary quality of the writing which distinguishes it from others dealing with the same subject.

In the Preface we are told that the author's aim is to give " in fair outline the chief movements of the Age of Democracy." With this in view, the political aspect of the period necessarily receives most attention. It is surprising, however, to find that Miss Ketelby has made little reference to British politics. Perhaps she assumed that the main facts of British history in the nineteenth century would be familiar to most readers. Whatever the reason for the omission, it leaves one with the impression that Great Britain might easily have figured more prominently in the book without upsetting the balance of the narrative. As it is, the general reader without much knowledge of the subject may forget that Queen Victoria, for example, was at least as great a force in world affairs as, say, Napoleon III, or that the development of democratic movements owed much to the genius of the British as well as to Continental peoples.

This is but a minor criticism of a book which has so many excellent qualities that it can be strongly recommended to anybody who wishes to have a compact but well-written survey of world history from 1789 onwards. It should prove particularly valuable to students preparing for examinations, such as the Staff College Entrance Examination, and to the general reader who seeks enlightenment on the causes, the course and the after-effects of the war.

N. W.

The Art of Study. By Professor T. H. Pear. (Kegan Paul. Price 3s. 6d.)

This little book is packed with solid matter which all students should try to digest. Although it is addressed to young students, it can be read with profit by everybody preparing for examinations, no matter what his age may be. After all, ordeal by examination is the same whether the candidate be young or old, and nobody who is about to face one of the many educational hurdles should allow Professor Pear's advice to pass unheeded.

This book is not a mere collection of tips on how to pass examinations.

It is a considered statement of the difficulties of systematic study, with suggestions as to the best means of overcoming them. Beginning with a chapter on "What is Learning?" Professor Pear proceeds, step by step, to reveal to the reader in simple, non-technical writing the mental processes involved in remembering, understanding and behaving. He explains why some fail where others succeed. Above all, he suggests how the student can make the best use of his hours of study. To the practical student who wishes to have something definite to apply to his own experience, the three chapters on "How to Concentrate," "How to form Habits of Study," and "Practical Aids for Memorizing" should prove of inestimable value. But the real worth of the book lies in its revelation to the uninitiated of the obvious but often-neglected truism that a student should know something of how his own mind works. Everybody who plays games seriously knows how important it is to understand his physical idiosyncrasies, but how few bother to apply to their minds a principle which they never forget when training their muscles? A left-handed bowler would not expect to bowl equally well with his right hand, but many a student who remembers best through his ears persists in trying to memorize solely through his eyes. Why? Simply because he has never realized how his memory works. The merest glance at Professor Pear's book would soon convince him of the importance of studying his own mental processes.

As the book is short and written in lucid English, it should not tax even the most stupid. To the intelligent but uninstructed reader it should be a boon and a blessing. Anybody who reads these lines and who is preparing to face the examination room with all its real and imaginary terrors, is recommended to put his books on one side for an evening and to read this book instead. If he does not profit by it we shall be surprised.

N. W.

SQUADRON OF DEATH: STUNTING FOR THE MOVIES. By DICK GRACE. (London: Constable & Co., Ltd. 7s. 6d. net.)

The remarkable thing about this book is that it is true; yet it would be difficult to find in fiction anything so breathlessly sensational. It is a great book because it is the record of human achievement and experience in a new sphere, and it is of first-class importance psychologically. This is the reviewer's considered opinion, in spite of the fact that the volume has the outward appearance of, and is written somewhat in the manner of, a "thriller."

Dick Grace is the sole surviving veteran of the Squadron of Death, that band of daredevil movie stunt men, fliers, divers, horsemen, who daily mortgage their lives to provide thrills for the public. In the writing he simply lets himself go, and, although lacking the cultivated art of the professional penman, nevertheless achieves brilliance. Without effort, he makes pictures, revealing with equal fidelity the objective scenes and the men and women he met, and also the souls within him and them. There are neither chapter headings nor index, but the omission is not due to a too-common slovenliness in modern book-making: they are not necessary, for the reader begins at the beginning and goes right on to the end.

Dick Grace has crashed over thirty planes intentionally. He broke his

neck making "Wings," that wonderful flight-film triumph of organization, and he survived and resumed his work. He has made over 160 changes from aeroplanes in flight to railway trains, motor-cars, motor-boats, and to other planes in mid-air.

Here is an example of his style from the very first page. It is a reminiscence of boyhood and the things that interested him:

> "The night hawks flew in pairs, male and female. They had their signals in the air. I wondered what those signals were, and I'm wondering now. We couldn't do better in the War than copy them. They'd start together, and separate till they'd flown far apart. But on that signal they'd dive earthward, then straighten out and pass each other like streaks of lightning. As they did this they'd open their beaks to give a peculiar call. This was evidently a signal to gather speed and zoom high into the sky side by side."

The narrative is punctuated by fatalities, of which few details are omitted. Many of them are very horrible, and over and over again the reader will ask himself: Is it worth while? Is it right that these heroes should be sacrificed to make a Roman holiday? The pictures of film magnates callously demanding the sacrifice and paying for it, in too many cases screwing down the payment to desperate men who get caught up in the glamour and excitement, becoming willing slaves, are not pleasing. We see Hollywood at its worst.

Grace saw his friend Locklear killed. Locklear and his pilot Skeets were doing a stunt in a plane lit with phosphorous flames to represent a blazing aeroplane. He saw the aeroplane get into its programme spin, but to his horror the pilot appeared to lose control. It fell one, two, three thousand feet.

> "'Bring it out,' I said to myself as if I spoke to Locklear. But the spin kept on. 'Bring it out! Bring it out! For God's sake, Lock, quick! BRING IT OUT!'
>
> "But he went on falling. I started to run—my hands were wet with sweat. 'Out quick!' I stumbled and fell flat on my face, at the same time I heard the ungodly crash that only those witnessing a tail-spin into the ground can understand.
>
> "When I got to my feet the sky was red with the blaze. The plane had fallen into the pool of an oil well. Locklear and Skeets had joined another squadron! That night I got drunk!"

The story of the attempt to secure his services as airman in a drug-running business is an epic in itself. Gifts, bribery, and finally blackmail were attempted, and after his final refusal there were attempts on his life.

Is it worth while, all this playing with death? The reviewer is inclined to answer that it is not; and yet it is possible that these carefully contrived crashes, to all appearance inevitably fatal, yet so skilfully managed that out of the shattered and sometimes blazing fragments a whole man emerges, may teach something to the aircraft designer and the pilot. Is not there a germ of hope in the fact that aeroplane crashes can be so contrived as to be reasonably safe for pilot and passenger? But, then, we must remember that the casualty rate is very high, almost as high as if there were no precautions, for many movie men did only one crash, their first and last.

Dick Grace says that after one stunt (not an aeroplane one), when he had been called upon to repeat the performance again and again, and

it appeared the director was demanding repeats merely for his own amusement:

> "As I got up I looked them over. So this again was the attitude of those for whom we made thrills. As far as we were concerned, just a nonentity. A bunch of flesh just thrown together to furnish necessary footage for the pictures—and when we were worn out, or killed, they could always find more fools to take our place."

It does not enamour one of the cinema. Still less does the strangely moving story of the beautiful horse which was made to leap off a 60-foot precipice, all its instincts revolting, turning again and again from the very edge, and finally goaded to what it must have believed suicide. True, neither the horse nor rider was hurt. But others than professed humanitarians, after reading this episode, will forswear the cinema for ever.

After one aeroplane-crashing stunt for which 500 dollars was to be the fee, the manager handed him only 300. He writes:

> "Well, I knew that the courts of justice were no good place for a case of Stunt Man *v.* Studio. In the first place I'd lose the suit, and in the second I'd be barred from the lot."

Popular "stars," of course, get the credit, but in the great majority of cases it is the unknown "double" who does it in their place.

The author tells the story of that remarkable crash in "Wings" when an aeroplane is seen plunging into a house at full speed, the pilot marvellously escaping. Many other crashes are described at length, and horror is piled upon horror in stories of failures ending in death or in frightful injuries. In the making of "Wings," by the way, twenty-four hangars full of aeroplanes were used, and the great majority of the U.S.A. Army's Air Force east of the Rockies were assembled.

And the stunt artists—those who do not break down, or get killed, or maimed for life—get to like it in some mysterious way! It becomes like a drug to them. They are extraordinarily loyal to their salt. They are in their way artists; and, notoriously, artists are ever exploited by the men of capital. But, apart from all that, there is in this remarkable record much matter of importance and deep interest to the student of psychology. Here we see, bought and sold, a type of individual courage, not inspired by love of country, not driven on by the spirit of battle, not evoked by instinct of self-preservation or self-defence, not even avid of popular applause (although naturally winning some little local glory). There is nothing surpassing this—one doubts whether there is anything equalling it—in the epics of Ancient Greece and the sagas of the North.

C. C. T.

FURTHER ASPECTS OF MECHANIZATION. By Brig.-General H. ROWAN-ROBINSON, C.M.G., D.S.O., *p.s.c.* (William Clowes & Sons, Ltd. Price 6s. net.)

"Speed is at our disposal in the air, on the road and across country, and wireless places it under our control in all its forms. There is delay in the march neither of invention nor performance; and the direction of progress is clear." These are the salient facts upon which the author bases his arguments for a bolder policy of mechanization, and we must

admit that, generally speaking, he has made out a strong case. In his opinion, present policy, though aiming originally at sound and attainable ideals, is being detracted to a great extent from its path.

Great Britain and America alone have taken seriously to the replacement of men by mobile machines, and they both incline rather towards motorization than mechanization. In the latter respect, France follows suit. The remaining nations are backing the anti-tank gun against the tank. The author disagrees with both views, and holds that success in the warfare of the future in average terrain in civilized countries lies in the purest form of mechanization. The qualification "*in civilized countries*" is an important one to note, for we must always bear in mind the fact that our Army has to be prepared to fight in any part of the world and in widely different terrain. Hence the need for a policy that allows for such eventualities and for our Army being so equipped that it is ready to operate with success in any terrain. To prepare for a great war, like the last, and to prepare for a small war in such widely different terrain as is to be found within the Empire are two very different problems.

However, this is not to say that we entirely disagree with the author's view for a bolder policy of mechanization, for many of the more difficult problems peculiar to these small wars with which our Army has hitherto been confronted have now been solved by the advent of aircraft. The value of aircraft to the mechanized forces is eloquently brought out by the author, who stresses the importance of close co-operation with the Air Forces, for "it is of course wholly wrong to write of 'Mechanization' and 'Air Forces' as of two different matters, for aeroplanes are the superlative shape which mechanization has taken"; to which question he devotes a whole chapter. It will repay every officer in the Air Force to study this book and to follow closely the developments in mechanization, and the organization and tactics of an Armoured Fighting Force, for who can gainsay, like the author, that the day is not far distant when the whole question of the control of a land battle will not be transferred to the air? It is already abundantly clear that Air and Armoured Forces have much in common and are to some extent inter-dependent.

"The relation of the Air Force to the other armed forces is a matter of cardinal importance in our defence problem." Do not, as the author of this book warns us, let us "regard the aeroplane as a sacrosanct and the property of the air force."

THE DEFENCE OF BOWLER BRIDGE. By H. E. GRAHAM. (William Clowes & Sons, Ltd. Price 3s. 6d. net.)

In his Preface to this excellent little book, the author refers to "The Defence of Duffer's Drift" and explains that it was an ingenious idea for illustrating certain minor tactical principles involved in holding a river drift against Boers, or any similar enemy. "Times have changed, and with them the methods of conducting war. Perhaps the most striking change is the advent of the armoured fighting vehicle, of which, as it happens, the author (now known to be Major-General Sir E. D. Swinton, K.B.E., C.B., D.S.O., M.A.) of 'Duffer's Drift' was one of the earliest advocates."

By methods similar to those adopted by the author of "Duffer's

Drift," Mr. Graham has endeavoured to present his views as to how river crossings should be held and how road blocks should be made or defended.

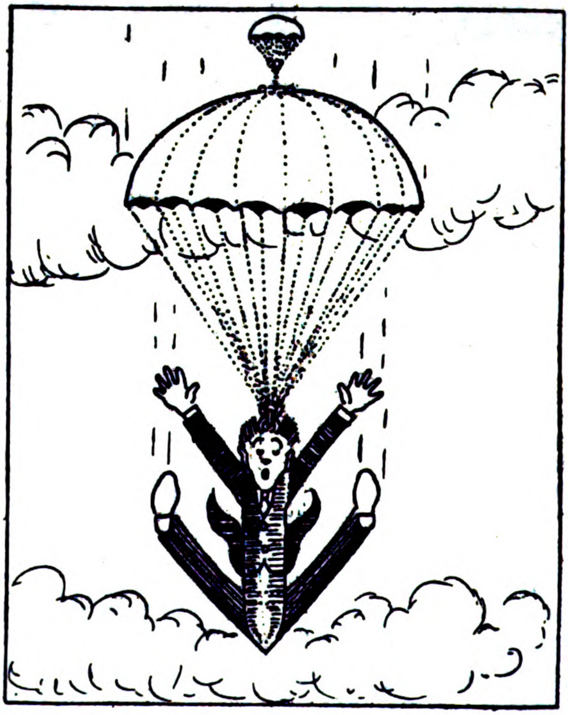
Readers of THE ROYAL AIR FORCE QUARTERLY may be interested to know that the Air plays its part—and an important one—at the critical moment in the defence of Bowler Bridge. "You are right, Corporal . . . that is a squadron of single-seater fighters, and, by Gad! they are going after those b—— guns, and I hope they give them hell." "Day Bombers, or I am a Dutchman!" exclaimed Smith. "I am off to the church tower to see the fun."

Needless to say, the defenders won the day.

As a study in minor tactics this little book teaches one in half an hour more than many hours of laborious reading of official text-books. It affords, moreover, a delightful half-hour's entertainment.

C. G. B.

AIR MINISTRY SECRET



THE DISGUISED BOMB.

ARTICLES OF AERONAUTICAL INTEREST APPEARING IN CONTEMPORARIES.

"THE ARMY QUARTERLY."

January, 1930. *Vol. XIX, No.* 2.

"Air Photographs and their Military Uses." By Capt. A. C. Duff, M.C., R.E.

"CANADIAN DEFENCE QUARTERLY."

January, 1930. *Vol. II, No.* 2.

"Flying Operations of the Hudson Straits Expedition." Illustrated. By Flight-Lieut. F. S. Coghill, R.C.A.F.

"The Making of a Canadian Air Pilot." By Stuart Graham.

"The Gallant Mad Major." By "Hook, Line and Sinker."

"THE FIGHTING FORCES."

January, 1930. *Vol. VI, No.* 4.

"The Fleet Air Arm." By Wing-Commander C. E. Maude, R.A.F.

"The Service Staffs and the Nation." By the Editor.

"A Night Flight." By "Flute."

"JOURNAL OF THE ROYAL UNITED SERVICE INSTITUTION."

February, 1930. *Vol. LXXV, No.* 497.

"The Attack of Daylight Bombing Formations." By Air-Commodore C. R. Samson, C.M.G., D.S.O., A.F.C., R.A.F. (ret.).

"Blind Flying." By Capt. G. MacLeod Ross, M.C., M.Eng., A.M.Inst.C.E., R.E.

"Air Defence." By Colonel H. W. Hill, C.M.G., D.S.O.

"Armoured Cars and the Royal Air Force: A Reply." By Capt. R. G. Lewis, *p.s.c.*, Royal Tank Corps.

"THE ROYAL ENGINEERS JOURNAL."

March, 1930. *Vol. XLIV*.

"Airships and the Empire." By Bt. Major G. MacLeod Ross, M.C., M.Eng., A.M.Inst.C.E., R.E.

"THE ENGINEER."

March 14*th*, 1930.

"The International Aspects of Civil Aviation."

ROYAL AIR FORCE SPORT.

QUARTERLY REVIEW.

By The Secretary, R.A.F. Sports Board.

Before dealing with the activities of the various Sports Associations of the Royal Air Force during the past quarter, a word or two on the organization of sport in the Royal Air Force might be of assistance and general interest to all readers. The following is a brief outline of the general policy which has resulted from the formation of the Sports Board and the activities of the Board as now constituted.

During the war and prior to the formation of the Air Ministry and the Royal Air Force, the sports activities of the Royal Flying Corps depended largely on assistance derived from the two senior Services.

After the war and soon after the formation of the Air Ministry as now constituted, what was known as the R.A.F. Recreational Council was formed in 1918 to reorganize on a sound basis the different R.A.F. Sports Associations with their properly constituted Committees, and to see that they conducted the various games in the true spirit of the strictest amateurism and maintained the high standard already set by the Royal Navy and Army. The Council consisted of representatives from the various R.A.F. Sports Associations under the chairmanship of the Inspector of Gymnasia, Air Ministry, a post soon after abolished.

A certain sum of non-public money was placed at the disposal of the Council to be used by them, as and how they thought best, for the encouragement of all branches of sport.

Later, in 1921, it was decided to reorganize the Council and to rename the authoritative body " The R.A.F. Sports Board." This title was in keeping with the representative bodies of the other two Services (viz., the R.N. and R.M. Sports Control Board, and the Army Central Sports Board).

The reconstituted Board consisted of the Air Officers Commanding Coastal and Inland Areas, Cranwell and Halton, the first Chairman being the Director of Equipment, (then) Air-Commodore C. L. Lambe, C.B., C.M.G., D.S.O.

Recently the membership of the Board has been increased by the addition of the Air Officers Commanding Wessex Bombing Area and Fighting Area, and a representative from Headquarters, Air Defence of Great Britain. The present Chairman is Air Chief-Marshal Sir J. M. Salmond, K.C.B., C.M.G., C.V.O., D.S.O., A.D.C., Chief of the Air Staff.

Owing to the rapidly increasing number of Associations, most of which required financial assistance to place them on a sound footing, a further sum of non-public money was granted to the Board to be used at their discretion. At the present time there are fourteen Sports Associations under the control of the Board:—

R.A.F. Athletic Association.
R.A.F. Boxing Association.
R.A.F. Cricket Association.
R.A.F. Fencing Union.
R.A.F. Football Association.
R.A.F. Golf Association.
R.A.F. Hockey Association.
R.A.F. Lawn Tennis Association.
R.A.F. Point-to-Point Committee.
R.A.F. Polo Club.
R.A.F. Rifle Association.
R.A.F. Rugby Union.
R.A.F. Squash Rackets Association.
R.A.F. Swimming Association.

All these organizations have their own properly constituted Committees and the policy of the Board is not to interfere with these Committees, but to allow them to run their respective Associations according to their own needs, unless any principle affecting the Service or the particular sport is involved, when the matter is referred to the Board for a ruling. The Board are fully aware that certain Associations are unable to carry on successfully and with credit to the Service without financial assistance. This applies more particularly to sports which do not produce a gate, *e.g.*, athletic and cross-country, cricket, hockey, and swimming. In such cases the Board affords assistance by making grants. An Association in need of financial assistance is required to submit a balance sheet when making application for a grant, and, provided the Board are satisfied that assistance is necessary, the grant is approved.

The Board meet as a rule once in every six weeks. At these meetings various subjects, including all questions which have been submitted to the Secretary from outside sources since the last meeting, are discussed, and money grants and loans to assist recreational facilities in general throughout the Force are made.

For some time past the Board have had under consideration a scheme for the provision of squash courts at many R.A.F. stations by which stations will be assisted very materially in meeting the building costs. Squash courts are greatly needed by R.A.F. officers in general, as they supply the means of obtaining more exercise in a short time than is provided by any other form of sport. The courts will therefore supply a long-felt want.

Very close touch is kept between the three Services in all matters affecting sport, not only by the Secretaries of the Boards concerned, but by Inter-Services Committee meetings held in connection with various events. Since the formation of the R.A.F. the advance in all directions has been both rapid and consistent, and it may be said without hesitation that the Royal Air Force are living up to the reputation of the other two Services in all branches of sport.

A Sportsman.

When the Great Scorer comes
  To write against your name,
He writes not that you won or lost,
  But how you played the Game.

—*Rudyard Kipling.*

FIXTURES, APRIL—JUNE, INCLUSIVE.

Wed.	April	2	Assn. Football	R.A.F. Senior Cup Final.
Wed.	,,	2	Golf	R.A.F. *v.* The Royal Navy, at Camberley Heath.
Fri.	,,	4	Fencing ...	R.A.F. *v.* London Fencing Club, at L.F.C.
Wed.	,,	9	Assn. Football	R.A.F. Junior Cup Final.
Wed.	,,	9	Boxing ...	A.B.A. Championships, at Albert Hall.
Tues.	,,	15	Golf	R.A.F. *v.* The Army, at Westhill.
Wed.	,,	16	Boxing ...	R.A.F. Team Championships.
Wed.	,,	16	Athletics and Cross-Country	Inter-Service Cross-Country Championships, at Portsmouth.
Wed., Thurs., Fri.,	,,	23, 24, 25	Golf	R.A.F. Spring Meeting, at Walton Heath.
Sat.	May	10	Athletics ...	Inter-Collegiate Triangular Contest, Athletics, at Woolwich.
Wed.	,,	14	Cricket ...	R.A.F. College *v.* Lincolnshire Gentlemen, at Cranwell.
	June			
Mon.-Fri.	,,	2-6	Rifle Meeting	R.A.F. Rifle Meeting, at Bisley.
Tu.& W.	,,	3-4	Cricket ...	R.A.F. College *v.* Royal Military Academy, at Woolwich.
Fri.& Sat.	,,	6-7	Cricket ...	R.A.F. College *v.* Leicester Gentlemen, at Cranwell.
W.-Fri.	,,	11-13	Cricket ...	R.A.F. *v.* Royal Navy.
Fri. & Sat.	,,	20-21	Cricket ...	R.A.F. College *v.* Adastrians, at Cranwell.
Wed.	July	2	Cricket ...	R.A.F. College *v.* Old Cranwellians, at Cranwell.
Fri.& Sat.	,,	4-5	Cricket ...	R.A.F. College *v.* Cryptics, at Cranwell.
Sat.-Sun.	,,	19-20	Cricket ...	R.A.F. College *v.* Yorkshire Gentlemen, at Cranwell.

R.A.F. Athletic and Cross-Country Association.

The Annual triangular match between teams representing Middlesex County, Civil Service, and the Royal Air Force, was run over a six-miles' course at Northolt Aerodrome, and resulted in a win for Middlesex, who repeated their performance of 1929.

Despite the heavy going, the race produced some fast times. S. Stubbs, Middlesex, was the first man home in 35 mins. 15 secs., thus beating the Middlesex Championship time for that course by several seconds. B. C. V. Oddie, Civil Service, was second in 35 mins. 38 secs., and Cpl. S. Ferris, Royal Air Force, third, in 35 mins. 48 secs.

The final team placings were :—Middlesex, 42 ; Civil Service, 61 ; Royal Air Force, 82. Individual Placings : 1st, S. Stubbs, Middlesex ; 2nd, B. C. V. Oddie, Civil Service ; 3rd, Cpl. S. Ferris, Royal Air Force. Royal Air Force team : Cpl. S. Ferris (Uxbridge), Cpl. W. Tym (Martlesham Heath), Sergt. H. R. Ellis (Shrewsbury), A.C. G. Moore (Wittering), A.C. G. Brown (Martlesham Heath), A.C. E. Stone (Kenley), A.C. P. Green (Duxford), A.C. H. R. White (Shrewsbury), A.C. J. Foley (Halton).

R.A.F. Fencing Union

The results of the matches this year are as follows :—

Royal Air Force *v.*

Tassarts (Foil) ...	Won, 15—12	Oxford ...	Won, 17—10
Tassarts (Épée) ...	Lost, 17—10	Cambridge ...	Won, 17—10
University of London Fencing Club ...	Won, 15—12	Royal Navy ...	Won, 24—12
		Bertrands ...	Lost, 15—12

THE ROYAL AIR FORCE *v.* THE ROYAL NAVY.

Foil—

Sqdn.-Ldr. Sherriff	No defeats
Sergt. Hancock	1 defeat
Cpl. Turner	2 defeats
R.A.F.	3 defeats
R.N.	6 defeats

Épée—

F./Lieut. O'Donnell ...	2 defeats
F./Sergt. Bishop	No defeats
Sergt. Stubberfield ...	No defeats
R.A.F.	2 defeats
R.N.	7 defeats

Sabre—

Sqdn.-Ldr. Sherriff	1 defeat
Sergt. Hancock	1 defeat
P./O. Tindall-Carill-Worsley	2 defeats
R.A.F.	4 defeats
R.N.	5 defeats

Bayonet—

Cpl. Eyles	No defeats
P./O. Wood	2 defeats
L.A.C. Richards	1 defeat
R.A.F.	3 defeats
R.N.	6 defeats

The annual inter-unit competitions were held at Uxbridge on February 28th and 27th. Twelve stations entered and were divided into two classes, senior and junior, the dividing line being that of a strength of 500.

Senior : Manston, Cranwell, Henlow, Andover, Uxbridge and Halton.

Junior : Calshot, Hornchurch, Worthy Down, Grantham, Digby, Lee-on-Solent.

The fighting in both classes was very keen, Cranwell winning the senior from Manston, and Calshot the junior from Grantham, by very narrow margins. The Senior Trophy is a silver figure of a fencer, presented this year to the R.A.F. Fencing Union by the Royal Tournament Committee. The Junior Trophy is a cup given by the late President of the Union, Lord Trenchard.

R.A.F Football Association

The representative XI is again enjoying a successful season. Cpl. Robinson and A.C. Kelly have gained international caps for England and Ireland respectively. Every other member of the side have won their county caps. At New Year a most enjoyable tour was undertaken to the Channel Islands. Both from a playing and a social point of view, the team completely won the hearts of all the Islanders. Both games were won and, what is more important, the local inhabitants were treated to an exhibition of clever football of the very best amateur type.

RESULTS.

November 7th, 1929 ...	R.A.F., 7 ;	London University, 0.
December 11th, 1929 ...	R.A.F., 0 ;	Spartan League, 0.
January 1st, 1930 ...	R.A.F., 3 ;	Jersey Combined Clubs, 2.
January 2nd, 1930 ...	R.A.F., 9 ;	Jersey Amalgamated, 2.
January 8th, 1930 ...	R.A.F., 2 ;	Middlesex, 1.
January 9th, 1930 ...	R.A.F., 1 ;	Football Association XI, 6.
January 18th, 1930 ...	R.A.F., 1 ;	Corinthians, 5.
February 12th, 1930 ...	R.A.F., 1 ;	Civil Service, 0.
March 15th, 1930 ...	R.A.F., 4 ;	Army 2.

R.A.F. Hockey Association

RESULTS.

January 8th, 1930 ...	R.A.F., 5 ;	Royal Engineers, 1.
January 15th, 1930 ...	R.A.F., 1 ;	Bedford County, 1.
January 22nd, 1930 ...	R.A.F., 2 ;	Civil Service, 0.
January 29th, 1930 ...	R.A.F., 1 ;	Oxford University, 3.
February 5th, 1930 ...	R.A.F., 2 ;	Essex, 6.
February 8th, 1930 ...	R.A.F., 1 ;	Tulse Hill, 3.
February 12th, 1930 ...	R.A.F., 1 ;	The Army, 3.
February 26th, 1930 ...	R.A.F., 3 ;	Royal Navy, 2.

MIDDLE EAST.

December 19th, 1929 ...	R.A.F., 5 ;	The Army, 2.

R.A.F. Rugby Union

RESULTS.

January 4th, 1930	...	R.A.F., 10 pts.;	The Police, 5 pts.
January 18th, 1930	...	R.A.F., 5 pts.;	Bristol, 9 pts.
January 22nd, 1930	...	R.A.F., 15 pts.;	Cambridge University, 27 pts.
January 25th, 1930	...	R.A.F., 11 pts.;	Northampton, 21 pts.
January 30th, 1930	...	R.A.F., 11 pts.;	Leicester, 23 pts.
February 1st, 1930	...	R.A.F., 5 pts.;	Bedford, 5 pts.
February 8th, 1930	...	R.A.F., 3 pts.;	Royal Navy, 11 pts.
February 12th, 1930	...	R.A.F., 8 pts.;	Middlesex, 31 pts.
February 19th, 1930	...	R.A.F., 13 pts.;	United Banks, 8 pts.
February 26th, 1930	...	R.A.F., 3 pts.;	Oxford University, 10 pts.
		MIDDLE EAST.	
January 27th, 1930	...	R.A.F., 21 pts.;	The Army, 5 pts.

R.A.F. Squash Racquets Association

RESULTS.

December 16th, 1929	...	R.A.F., 0;	The Army, 5.
December 17th, 1929	...	R.A.F., 3;	The Royal Navy, 2.

Annual Review of Sports at Cranwell

Quique pedum cursu valet et qui viribus audax
Aut iaculs incedit melior levibusque sagittis,
Seu cruds fidit pugnam committere caestu,
Cuncti adsint.

And what the good old Æneas said can well be applied to Cranwell, for are there not at least a dozen sports for which must be produced representative sides, although the maximum personnel available is about one hundred, and this number includes an average proportion of passengers which is never small. In this first review it may not be out of place to make some reference to the difficulties that have to be faced in attaining the standard of sports at Cranwell, in order that the individual effort may be appreciated. Great as the demands have been, they have been met generously, and a retrospect over 1929 provides a certain satisfaction, not merely from the competitive results, but rather from the general standard of attainment. The location of Cranwell emphasizes the difficulties, for expenses in travelling are heavy and the serious loss of instructional time in many subjects calls for a redoubled effort on the part of the individual if he is to retain his proper standard. The redoubled effort is the more difficult for the contribution made by the sporting individual is not only one of time given to College sports, but also one of expenditure of energy which may militate against serious work in the evening. There is, too, the boredom of wasting time in long journeys, time which in an intensive scheme is invaluable. Full credit must be given for all this, for others not as physically blest have many more hours of leisure at their disposal in which to improve their intellectual standard, if necessary.

Though Rugger has practically finished, the spring session is always a very busy one. The few odd Rugger games serve as a " try out " for promising players in the new entry, but most of the time is devoted to hockey, athletics, cross-country, boxing, skill-at-arms, and some golf. The demands of all these sports in one session may prove a very serious tax, and they can only be met if everyone who has any talent gets down to do his bit. Except in the case of 'Soccer, much of the material is very raw, but if willing can be trained. The last spring session, however, will be remembered for the continuous and intense cold which prohibited all ground games for several weeks, but provided some skating instead.

The hockey team did carry out several fixtures, but it was by no means strong, and owing to the difficulty in getting suitable matches the team is always liable to appear rather a scratch side, consisting of a few real hockey men, supported by some rather crude Rugger and 'Soccer men. The fixture with R.M.C., however, despite the rather heavy defeat, furnished quite a good game and was encouraging. One of the remarkable features of the game was that two or three of the Cranwell side had been boxing at Sandhurst the night before and had left there at dawn or earlier in order to be back for the game. Energy indeed! Unfortunately, the match with R.M.A. had to be scratched owing to snow and frost.

The boxing team was not particularly lucky, for it lost to R.M.A. and R.M.C. by the

Photo] [The Sport and General Press Agency, Ltd.

R.A.F. Representative Rugby XV, 1929-30.

Back Row.—**L.A.C. V. E. Maxwell. P./O. R. L. Wallace. F./O. F. S. Hodder. Sergt. A. C. Hall. P./O. W. V. McKechnie. Ft./Sergt. W. I. G. Kirby. P./O. G. M. Ievers. F./O. J. G. Llewelyn.**

Seated.—**F./O. R. D. Cotton. Ft./Lieut. J. G. Franks. Ft./Lieut. R. V. M. Odbert. W./Cdr. J. C. Russell. F./O. H. A. Constantine. P./O. G. E. S. Williams. F./O. J. R. H. Pott.**

R.A.F. Representative Hockey XI, 1929-30.

Back Row.—**Cpl. C. Butler. L.A.C. F. Connell. L.A.C. L. R. Hobbs. F./O. W. K. Beisiegel. P./O. D. P. Lascelles. F./O. S. C. Bufton.**
Seated.—**F./O. H. M. Jerram. Cpl. L. G. Beeton. Ft./Lieut. H. N. Hampton (captain). Sergt. W. C. Maher. F./O. H. E. Sales.**

odd fight in each competition, and by a very narrow margin of points; the main losses were in the lighter weights. Some compensation was gained from R.M.A. by a victory in skill-at-arms; the team displayed very good form in all its fixtures.

Athletics, of course, take precedence in this session, and without a doubt the team was above the average, but it had much to endure from the rigour of the weather. So cold was it, and so hard was the ground, that any team might be forgiven for hesitating to visit Cranwell, and thanks are due to the Cambridge Colleges—the only possible matches—for their sportsmanship in keeping their engagements. Of these meetings, Cranwell won two, lost one and drew one. The L.A.C. brought a good team to beat the College later in the season, while some of the "Past" formed a scratch side for another enjoyable match which was won. Perhaps this last match can become a regular fixture.

But the triangular contest is the competition that counts, and it was held this year at Aldershot. It proved worthy, too, of all the anxious anticipation, for the margin between Cranwell and R.M.C. was very small throughout, and was only increased to eight at the end when R.M.A. stepped into the first places and R.M.C. into the others; it was indeed a fine competition. It is somewhat unfortunate that the athletic training has to be so prolonged, February to May (this is due to the fact that Cambridge go down so early), for it puts a serious strain on the whole team; in the end it overlaps the cricket season and keeps men out of the side. The team must be congratulated on its endurance and energy; next season there is promise of an improved track.

Squash came into a greater popularity this year, and a six which was formed for competition with the various local messes met with some success.

Summer came in so suddenly and with such a drought on top of the frost which persisted into May, that great difficulty was experienced with the grounds owing to the light soil. It was curious to see the top dressings of the early spring still lying undisturbed on the surface in September. This year, however, some real improvements had been made and the wickets were very much better; for this a tribute is due to those who supervised affairs so carefully. The fixture list, too, has improved, and, given anything like a supply of cricketers in the new entries, the future can be viewed with a little confidence. In no season have there been more triers or a more regular attendance at the nets. The general results of the matches were disappointing. The failure appeared in many cases to be temperamental; impatience was obvious, and this rarely brings success. It was no bad side, but it failed to come off, though the match with R.M.A.—renewed, it is hoped, permanently—showed much promise until spoiled by the weather; but even in that game too much was left to two men. To retain the better fixtures, full use must be made of all the available material, and there must be some determined training in all departments of the game. Bowlers are required urgently and must practise *ad nauseam* until length becomes mechanical.

The tennis six is well established, had many matches, and was quite successful.

Rowing had a livelier support than ever, despite the distance to Newark and the expense involved; two fours were able to compete in regattas, and rowed successfully against House fours at Eton.

In the autumn all interest turns to the matches with R.M.A. and R.M.C. The 'Soccer side was about up to standard. The Cambridge Colleges proved for the most part just too strong, and the officers' sides just too weak, while R.M.A. won by the odd goal after a very good game in which the thrust of the R.M.A. attack was superior to Cranwell's.

Finally there is the Rugger season—one might almost say the matches with R.M.A. and R.M.C. So fine were they this year that other, and good, games are liable to fade from memory. These games include those with R.A.F. trial team, and the Past, both fought out with tremendous vigour and the issue determined by fitness. It was most unfortunate that none of the Cambridge sides could come this season, for they provide experience and new ideas, besides hard matches. Confessed the distance is great and the weather often bad, but so important are the matches to Cranwell that it is to be hoped that in future sides will keep their engagements. Of the matches with R.M.A. and R.M.C. little need be said here, for it has been read elsewhere. "The game's the thing"—and that being so, everyone who saw the games will confess that they saw "the thing." Desperately hard games in both cases, with the issue open until no-side! At Camberley R.M.C. won; at Cranwell R.M.A. drew, and perhaps they were unlucky. They have decided the issue between them since, and the winners are to be congratulated. The XV of 1929 will go down to history as one composed of the greatest triers, which suffered from an unfair share of casualties and from a certain shortage of effective reserves.

Taking it all round, the athletic record of the year can be viewed with satisfaction. The demand made on the small numbers has been a very heavy one, and there are several cadets who have been in continuous training throughout the year; some, too, have competed in at least four different representative contests with the other colleges. This effort, combined with the stress of flying training, is no small one. *Mens sana in corpore sano*—may it be so!

ROYAL AIR FORCE RIFLE ASSOCIATION.

MINIATURE RIFLE LEAGUE.

Nobel Challenge Cup.

This League was organized in the winter of 1926 for competition amongst units of the Royal Air Force stationed at home, and has for its objects :—

(*a*) To keep trained personnel in touch with rifle shooting during the winter months.
(*b*) To train young shots.
(*c*) To provide a useful service form of recreation throughout the winter.
(*d*) To raise the standard of musketry, voluntarily, throughout the Service.

Messrs. Nobel Industries, Ltd., present a valuable beaten silver challenge cup for this League, with ten silver medals for the winners and ten bronze medals each for the second and third teams.

The shooting of the winners has been of a very high standard indeed. Nobel's ammunition has been used in all the shooting, as they were the donors of the cup.

The competition is organized in two stages. In the first stage the units in each group or area shoot on the League principle, each team within the group or area shooting against each other. The second stage is run on the knock-out principle, each group or area being allowed to enter the best of each four teams in the first stage.

The first stage was commenced in October, 1929, and was concluded on February 28th, 1930.

The following table shows the various commands competing, the number of teams entered, and the winning teams of the first stage :—

Inland Area (17 teams entered) : Winners, first stage, H.A.D. (Henlow), 13 (A.-Co-op.) Squadron, C.F.S. (Wittering), and Eastchurch.

Fighting Area (13) : 23 (F) Squadron, 32 (F) Squadron and 111 (F) Squadron.

Bombing Area (8) : 10 (B) Squadron and Station H.Q., Andover.

Cranwell (6) : A Team and Flight-Cadets.

Halton (4) : No. 1 (A.A.) Wing.

Coastal Area (1) : Ineligible.

The draw in the second stage is as follows :—

32 (F) Squadron *v.* R.A.F. College.
10 (B) Squadron *v.* 13 (A.C.) Squadron.
H.D., Henlow, *v.* 1 (A.A.) Wing.
Eastchurch *v.* 111 (F) Squadron.
Byes : C.F.S., Wittering, 23 (F) Squadron, S.H.Q., Andover, Flight-Cadets.

The second stage will be completed by the middle of April, and the cup and medals will be presented to the winners at the conclusion of the Annual Meeting at Bisley on Friday, June 6th, 1930.

R.A.F. RIFLE ASSOCIATION *v.* EMBANKMENT RIFLE LEAGUE.

First Match, fired in December, 1929 :—

	Score.
R.A.F. League	1939
Embankment League	1917

R.A.F. won by 22 points.

Return Match :—

Embankment Rifle League	1948
R.A.F. League	1939

Embankment League won by 9 points.

The Tenth Annual Meeting will be held on the Bisley Ranges from June 2nd to 6th, 1930, and the following is the daily programme :—

MONDAY, JUNE 2ND.

SWEEPSTAKES (UNLIMITED ENTRIES).

8.30 a.m. ... 300 and 600 yards ; 3 rounds and 1 sighter. Entrance fee, 1s. each entry.

TYRO COMPETITION.

(The "Longcroft" Tyro Challenge Cup and £7 5s. Prize Money.)

10.30 a.m. ... 600 yards ; 7 rounds and 1 sighter. Slow.
1.30 p.m. ... 300 yards. Egg Pool.
2.0 p.m. ... 300 yards ; 10 rounds and 2 sighters. Rapid.
3.0 p.m. ... 300 yards ; 10 rounds and 2 sighters. Snapshooting.
4.0 p.m. ... Sweepstakes and Egg Pool on all targets.
5.30 p.m. ... Pistol and Revolver Sweeps. Entrance fee, 1s. each series. Spoon prizes.

Arrangements will be made to have a number of targets available for Sweepstakes all day for Non-Tyros.

TUESDAY, JUNE 3RD.

THE R.A.F. RIFLE CHAMPIONSHIP (FIRST STAGE).

(The "Grant-Dalton" Challenge Cup, The "Burge" Challenge Cup, Silver and Bronze Medals and £34 Prize Money.)

8.30 a.m. ... Egg Pool on all targets.
9.0 a.m. ... 600 yards ; 10 rounds and 2 sighters. Slow.
10.30 a.m. ... 600 yards to 100 yards ; 10 rounds. Fire with movement.
1.30 p.m. ... Egg Pool on all targets.
2.0 p.m. ... 300 yards ; 10 rounds and 2 sighters. Snapshooting, 3 seconds exposure.

The Young Officers' and Airmen's Cup will be shot concurrently with the above.

THE "WHITELOCK" CHALLENGE CUP AND £10 PRIZE MONEY.

5.30 p.m. ... Pistol and Revolver Sweeps as for Monday.

WEDNESDAY, JUNE 4TH.

THE "TRENCHARD" (STATION) RIFLE CHALLENGE CUP.
(Silver and Bronze Medals.)

and concurrently with the above—

THE "BROOKE-POPHAM-STEEL" (SQUADRON) RIFLE CHALLENGE CUP.
(Silver and Bronze Medals.)

Time-table and ranges as for Tuesday.

AIRCRAFT APPRENTICES' TEAM MATCH.

5.0 p.m.	...	200 yards; 7 rounds and 1 sighter. Slow.
5.45 p.m.	...	300 yards; 7 rounds and 1 sighter. Slow.
6.30 p.m.	...	500 yards; 7 rounds and 1 sighter. Slow.

THURSDAY, JUNE 5TH.

8.0 a.m. ... Egg Pool on all targets.

THE R.A.F. RIFLE CHAMPIONSHIP (FINAL STAGE).

(The "Duke of Sutherland's" Challenge Cup, Aggregate, Silver and Bronze Medals, and £15 Prize Money; conditions as in First Stage.)

9.0 a.m.	...	600 yards. Slow.
10.0 a.m.	...	600 yards to 100 yards. Fire with movement.
11.0 a.m.	...	300 yards. Rapid.
11.30 a.m.	...	300 yards. Snapshooting.
1.30 p.m.	...	The R.A.F. Revolver XX Championship for the "Barton" Challenge Cup, Silver and Bronze Medals and £8 10s. Prize Money. On the N.R.A. Revolver Range, commencing at 50 yards.
3.30 p.m.	...	The R.A.F. Pistol (Individual) Championship for the "F. C. Halahan" Challenge Cup, Silver and Bronze Medals and £8 10s. Prize Money. On the N.R.A. Revolver Range, commencing at 10 yards. The R.A.F. Pistol (Unit Team) Championship for the "Salmond" Challenge Cup, Silver and Bronze Medals, will be shot concurrently with the Individual Championship.
1.30 to 5 p.m.		Sweepstakes and Egg Pool at 300, 500 and 600 yards.
8.30 p.m.	...	The Annual General Meeting.

FRIDAY, JUNE 6TH.

THE COMMAND CHALLENGE CUP, REPLICA, SILVER AND BRONZE MEDALS.
(Four targets per team.)

8.30 a.m.	...	600 yards; 10 rounds and 2 sighters. Slow.
9.15 a.m.	...	500 yards; 10 rounds and 2 sighters. Rapid.
9.45 a.m.	...	300 yards; 10 rounds and 2 sighters. Rapid.
10.15 a.m.	...	300 yards; 10 rounds and 2 sighters. Snapshooting.
11.0 a.m.	...	300 yards. Sweepstakes (S.R.b).

THE RIFLE XX MATCH (S.R.B)

(For the "F. C. Halahan" Challenge Cup, Silver and Bronze Medals, and £14 10s. Prize Money.)

and concurrently—

THE OXFORD AND CAMBRIDGE UNIVERSITY AIR SQUADRON MATCH

and

THE RETIRED OR RESERVE MEMBERS' MATCH.

1.30 p.m.	...	300 yards; 10 rounds and 2 sighters. Slow.
2.30 p.m.	...	500 yards; 10 rounds and 2 sighters. Slow.
3.30 p.m.	...	600 yards; 10 rounds and 2 sighters. Slow.
4.30 p.m.	...	PRESENTATION OF PRIZES: 12 Silver Challenge Cups, Silver and Bronze Medals and over £100 in Prize Money.
5.30 p.m.	...	Departure of competitors to rejoin their units.

PARTICULARS REGARDING ENTRY INTO THE ROYAL AIR FORCE

I.—OFFICERS.

General Duties Branch.

1.—Permanent Commissions.

Permanent officers are entered in such numbers as to provide in the ordinary course of promotion the officers required to fill the higher command, technical and general administrative posts in the Royal Air Force. In the earlier stages of their career they are engaged in becoming experts in flying duties: subsequently a large proportion are expected to specialize in one aspect of the work of the Royal Air Force, *i.e.*, engineering, wireless, armament, photography, or navigation, or in staff duties. The method of entry for permanent commissions is as follows:—

(*a*) *The Royal Air Force College*.—The Royal Air Force College is maintained to afford a special education lasting two years to flight cadets between the ages of 17½ and 19½ on entering the College.

Full particulars are given in Air Publication No. 121; price 3d.

(*b*) *University Graduates*.—A proportion of the permanent commissions granted in the Royal Air Force is offered to University men. Candidates for entry under this scheme must be graduates of their University, must be unmarried and between 20 and 25 years of age, and must be recommended by their University.

Full particulars are given in Air Publication No. 904; price 4d.

2.—Short Service Commissions.

The balance of junior posts is filled by short-service officers who are employed for a period of five years on the active list, after which they are required to serve a period of four years in the Reserve. A strictly limited number of permanent commissions are awarded to officers holding short-service commissions. The majority of such commissions awarded are allocated to officers qualifying for specialist training, but a few are also granted to those officers recommended as specially suitable by their Commanding Officer. A further strictly limited number of appointments to medium service are made to fill flying posts requiring greater experience. The period of medium-service employment on the active list is five years following immediately after the five-year short-service period, *i.e.*, ten years' employment on the active list, followed by four years in the Reserve.

Officers transferred to the Reserve after completing their full period of service in the active list will be paid a gratuity of £375 for five years' service, and £1,000 for ten years' service.

Entry to short-service commissions is by selection from men who are of good physique and reasonably well educated. Age limits, 18 to 29.

Full particulars are given in Air Ministry Pamphlet No. 13; price 2d.

Stores Branch.

A small number of vacancies for permanent commissions in the Stores Branch of the Royal Air Force are offered annually for competition to men who have had not less than five years' business or industrial experience in the employment of a company or firm of standing, and are between the ages of 23 and 25. Accepted candidates must pass an interviewing board and compete at a written examination conducted by the Civil Service Commissioners.

Full particulars are given in Air Ministry Pamphlet No. 17; price 2d.

Accountant Branch.

A small number of vacancies for permanent commissions in the Accountant Branch of the Royal Air Force are offered annually for competition to men between the ages of 22 and 26 who have a good theoretical knowledge and wide practical experience of accounting. Accepted candidates are required to pass an interviewing board and compete at a written examination conducted by the Civil Service Commissioners, the standard of the accountancy portion of which is that of the final examination of the Institute of Chartered Accountants and of the Society of Incorporated Accountants and Auditors.

Full particulars are given in Air Ministry Pamphlet No. 18; price 3d.

II.—AIRCRAFT APPRENTICES.

Aircraft apprentices are enlisted and trained as highly skilled craftsmen. Period of apprenticeship, three years. Entries take place twice yearly. Candidates are required to pass a competitive educational examination. Age limits, 15 to 17 years. Period of service, twelve years from the age of 18, but suitable men may be allowed to re-engage to complete twenty-four years for pension.

Full particulars are given in Air Ministry Pamphlet No. 15; free.

III.—APPRENTICE CLERKS.

Apprentice clerks are trained in general clerical duties or for specialist work in pay-accounting or in stores-accounting. Period of apprenticeship, two years. Entries take place quarterly. Candidates are required to have either an approved school certificate or to pass a competitive educational examination. Age limits, 15½ to 17 years. Period of service, twelve years from the age of 18, but suitable men may be allowed to re-engage to complete twenty-four years for pension.

Full particulars are given in Air Ministry Pamphlet No. 9; free.

The publications mentioned herein may be purchased from Gale & Polden, Ltd., Aviation Department, Wellington Works, Aldershot.

NON-REGULAR FORCES.

Information regarding the Reserve of Air Force Officers can be obtained from the Secretary, Air Ministry, London, W.C.2. Inquiries

as to appointment to the Special Reserve or the Auxiliary Air Force should be addressed to the officer commanding the squadron to which appointment is desired. The addresses of these squadrons are as follows:—

Special Reserve.

No. 501 (Bomber) Squadron.—Filton, nr. Bristol.

No. 502 (Ulster) (Bomber) Squadron.—Aldergrove, County Antrim, Northern Ireland.

No. 503 (County of Lincoln) (Bomber) Squadron.—Waddington, nr. Lincoln.

No. 504 (County of Nottingham) (Bomber) Squadron.—Hucknall, Notts.

Auxiliary Air Force.

No. 600 (City of London) (Bomber) Squadron.—Finsbury Barracks, London, E.C.1.

No. 601 (County of London) (Bomber) Squadron.—54, Kensington Park Road, Notting Hill, London, W.11.

No. 602 (City of Glasgow) (Bomber) Squadron.—49, Coplaw Street, Glasgow, S.2.

No. 603 (City of Edinburgh) (Bomber) Squadron.—Learmouth Terrace, Learmouth, Edinburgh.

No. 604 (County of Middlesex) (Bomber) Squadron.—Hendon Aerodrome. Applications to County of Middlesex Territorial Association, 66, Victoria Street, S.W.1.

No. 605 (County of Warwick) (Bomber) Squadron.—Castle Bromwich, Birmingham.

No. 607 (County of Durham) (Bomber) Squadron.—Aerodrome, Usworth. Applications to The Durham County Territorial Association.

No. 608 (County of York, North Riding) (Bomber) Squadron.—Aerodrome, Thornaby. Applications to North Riding Territorial Army Association.

R.A.F. MEMORIAL FUND

(*Reprinted from "The Times," March 8th*, 1930.)

THE ANNUAL REPORT.

The Executive Committee of the Royal Air Force Memorial Fund met at the offices of the Fund, 7, Iddesleigh House, Caxton Street, S.W., last Wednesday. Sir Charles McLeod, Chairman and Hon. Treasurer, presided, and the following members attended:—

Dame Helen Gwynne-Vaughan (Deputy Chairman), Lady Leighton,

Mrs. B. H. Barrington-Kennett, Mrs. L. M. K. Pratt-Barlow, Air-Marshal Sir E. L. Ellington, Air Vice-Marshal C. A. H. Longcroft, Air Vice-Marshal C. L. Lambe, Air Vice-Marshal T. I. Webb-Bowen, Air Vice-Marshal A. E. Borton, Air Vice-Marshal A. M. Longmore, Mr. F. E. Rocher, Lieutenant-Commander H. E. Perrin, and Mr. W. S. Field.

The annual report and statement of accounts for the general fund and the Vanbrugh Castle School Account were presented, and the state of the Struben Trust Account was also reported. This fund provides help for any relatives of any officer of No. 25 Squadron, R.A.F., who may be killed, or die, while on duty, and was instituted by Major Struben in memory of his late son, Flying-Officer H. M. Struben, No. 25 Squadron. So far no claim has been made on this trust fund.

The resignation from the Executive Committee of Air Vice-Marshal Sir Sefton Brancker was accepted by the Committee with great regret.

Between December 11th and March 5th the Grants Sub-Committee dealt with 63 appeals for help, and in the same period the Secretary dealt with 196 cases.

The Committee had before it a proposal to change the title of the Fund, various proposals being made, but ultimately, by vote, it was decided that no change should be made in the present title; but that when the Committee issues any posters or publications setting forth the activities of the Fund, the following words shall be inserted in brackets under the title: "For the help of all ranks in memory of those who died serving."

Various grants made by the Grants Sub-Committee out of the Salting Benefaction Fund and Anonymous Education Fund were approved by the Committee.

The next meeting of the Committee was fixed for Wednesday, April 30th, at 3 p.m.

GUILD OF AIR PILOTS AND AIR NAVIGATORS

The Guild of Air Pilots and Air Navigators of the British Empire is open to certificated air pilots and air navigators who are British subjects, whether resident at home or abroad, and who are master pilots, or have been for not less than five years the holders of a "B" Pilot's Licence, or First Class Airship Pilot's Licence, or a certificate of competency as a First-Class Navigator of Commercial Aircraft.

During the first year of the Guild's existence, the five years' qualification will be waived, and the Court have a discretion as to whom they elect. Applications for membership should be made to the Clerk of the Guild, L. A. Wingfield, Esq., Guild of Air Pilots and Air Navigators of the British Empire, 61, Cheapside, London, E.C.2.

THE ROYAL AERONAUTICAL SOCIETY.

(With which is incorporated the Institution of Aeronautical Engineers.)

EXTRACTS FROM MONTHLY NOTICES.

DONATION OF PHOTOGRAPHS.

The Council are very anxious to make the Society's collection of photographs of aeroplane subjects as complete as possible, and hope that every member will assist them as far as they are able to attain this object. Photographs are particularly wanted of aeroplanes, engines, personalities, and scenes covering the period 1906 to 1914, as these photographs are at present very incomplete.

THE SOCIETY'S AWARDS.

The attention of all members is drawn to the following particulars of the awards made by the Society. For the purpose of making awards, the Society's year is considered as being July 1st to June 30th, so that all awards for 1929-1930 will be considered for the period July 1st to June 30th, 1930. Further particulars of any of the awards will be sent on request.

R.38 MEMORIAL PRIZE.

The R.38 Memorial Prize is offered annually, at the discretion of the Council, for the best paper received by the R.Ae.S.I. on some subject of a technical nature in the science of aeronautics. Other things being equal, preference will be given to papers which relate to airships.

The prize is open to members and non-members of any nationality, and its value is 25 guineas.

SIMMS GOLD MEDAL.

The Simms Gold Medal is awarded annually, at the discretion of the Council, for the best paper read in any year before the Society on any science allied to aeronautics, *e.g.*, meteorology, wireless telegraphy, instruments. The medal may be awarded to a member or a non-member of the Society.

TAYLOR GOLD MEDAL.

The Taylor Gold Medal is awarded annually, at the discretion of the Council for the most valuable paper submitted or read during the previous session before the Society. The medal may be awarded to a member or a non-member of the Society.

SIR CHARLES WAKEFIELD GOLD MEDAL.

The Sir Charles Wakefield Gold Medal is awarded annually, at the discretion of the Council, to the designer of any invention or apparatus tending towards safety in flying. The medal may be awarded to a member or a non-member of the Society.

Elliott Memorial Prize.

The Elliott Memorial Prize is awarded to apprentices at Halton on the results of their examinations.

Society's Silver Medal.

The Society's Silver Medal is awarded, at the discretion of the Council, for some advance in aeronautical design, and is open to members and non-members of the Society.

Society's Bronze Medal.

The Society's Bronze Medal is awarded under the same conditions as those for the Silver Medal, but for some less important advance in aeronautical design.

The Herbert Akroyd Stuart Lectures.

Under the will of the late Mr. Herbert Akroyd Stuart, a sum of £700 is held in trust by the Society for the offer of a prize every two years, for the best paper or lecture read or given before the Society on " The Origin and Development of Heavy Oil Aero Engines." The prize is open to members and non-members, and its value is approximately £68. The closing date for the receipt of papers is June 30th, 1930.

Edward Busk Memorial Prize.

The Edward Busk Memorial Prize is offered annually for the best paper received by the Society on some subject of a technical nature in connection with aeroplanes (including seaplanes). Its value is 20 guineas. The prize is open to members and non-members of the Society.

Pilcher Memorial Prize.

The Pilcher Memorial Prize is offered annually, at the discretion of the Council, for the best paper by a student of the Society on heavier-than-air craft or any analogous subject. Its value is £5.

Usborne Memorial Prize.

The Usborne Memorial Prize is offered annually, at the discretion of the Council, for the best paper by a student of the Society on lighter-than-air craft. Its value is £5.

Membership Badges.

For those members of the Society who wish to have them, a badge has been prepared. The badge shows the symbols of the Society, the peregrine and balloon, in finely chased gilt on a blue enamel background, surrounded by a royal blue border, on which appears the lettering, " Royal Aeronautical Society, 1866." The badges have been hand-made with the greatest care, so that they will always retain their original appearance, and it is hoped that members will wear them on all suitable occasions. The price is 5s., or 5s. 3d. post free.

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Mary

H.R.H. PRINCESS MARY, COUNTESS OF HAREWOOD, G.B.E.,
President, Princess Mary's Royal Air Force Nursing Service.

THE "R. M. GROVES" PRIZE ESSAY, 1930

SUBJECT:

"The Civilizing Influence of Aircraft and of Imperial Air Communications."

BY WING-COMMANDER B. E. SMYTHIES, D.F.C., *p.s.a.*, R.A.F.

WHEN Pontius Pilate asked his famous question, "What is Truth?", he did not set a more difficult task than the modern concept "What is Civilization?" Only lately has civilization begun to be understood. Dr. Johnson, as Boswell tells us, proposed to omit the word from the dictionary, admitting only "civility" as opposed to "rustic" or "barbarian."

But it goes deeper than this; civilization should more properly be contrasted with man's animal heritage. Guizot, who a hundred years ago wrote seven volumes on the history of civilization, boldly stated that it consisted of "two principal facts: the development of human society and the development of man himself"; with this, Matthew Arnold's "the humanization of man in society" is sufficiently closely in accord.

We are immersed in civilization from infancy, and we take it for granted; we generally think of it as made up of mechanical devices, scientific knowledge, social and political institutions, ingenious methods of transportation, and similar aids to life, but it is impossible to deal with the subject entirely in its modern aspect. The student of war does not limit his studies to the last one in order to learn lessons for the future; because aircraft and air communications are new, it is no reason to consider only the aeronautical progress of the last two decades in order to determine the influence which aircraft are likely to exert on civilization of the future.

For civilization as we are now considering it is old, older than mechanical inventions, and must be dealt with on a correspondingly broad basis. The influence of a particular discovery is by no means confined to its immediate and obvious application; the African tribes, for instance, were deeply affected by the introduction of firearms and whisky; the perfecting of the steam engine not only revolutionized the transport of men and their wares, but, further, it caused Marx to write the gospel of a social upheaval which threatened the peace of mind of nations; the invention of clothes—quite material things—created great

industries but also enabled men artificially to establish social distinctions; through clothes entered in the pious horror of bare bodies which has wrought consternation among the dark-skinned folk.

Within the limits of this article, fancy cannot roam unrestrained over too vast a field; an attempt will first be made to trace the influence upon civilization of communications, since it is by communication that the conquest of the air seems most likely to benefit mankind.

The Early Civilizations.

Even before the dawn of history or of writing, the progress of later neolithic man can be followed along rivers, the first and still almost the most important form of communication. The seekers after tin in the early bronze age undoubtedly made use of the Danube and the Rhine to bring the products of England to their homes in the "Middle East," and the most cursory reflection on the earliest civilizations, when man emerged from the use of flint, shows how their existence was only made possible by the facility for local intercourse.

It is clear that civilization is primarily dependent on the settlement of man in an area continuously cultivated and continuously possessed. Nowhere, of any countries known to us, were favourable conditions found so surely and upon such a scale as in Mesopotamia and in Egypt. Here was a constant water supply under enduring sunlight; trustworthy harvests year by year, abundant building materials. In such countries men would wander and would multiply; the security of life would be increased.

Without communication, civilization might not only perish, but might never have arisen; the Tigris and Euphrates provided the Sumerians with an easy fertility and also with that freedom of transit which allowed of development. Race succeeded race in the valleys, Semites and Aryans, Medes, Persians and Greeks were in their turn swallowed up, novel things such as the horse, wheeled vehicles and iron were introduced, but still the rivers provided the chief means of livelihood and of carriage. "For four thousand years this new thing, civilization, which had set its root into the soil of the two rivers, grew as a tree grows; now losing a limb, now stripped by a storm, but always growing and resuming its growth."*

In Egypt, the influence of the river is even more marked. The Nile is Egypt's sole architect. It was the Nile, unassisted, which laid deep the foundations of the old Egyptian civilizations, which enabled the masses for those strange monuments the Pyramids to be transported, which gave to the princes of the Middle Kingdom the mastery of the country and the ability to spread their culture. The very simplicity of

* Wells: "Outline of History," p. 110.

life, with its river flowing by a single way, had, however, its disadvantages; stagnation ensued. It is difficult for modern men and women, living in an era of free and universal communication, to realize that for many thousands of years an entire civilization remained static, as the architecture of Egypt, a monotonous repetition of form, arrangement and conception, proves that it must have done.

Contrast it, for example, with the contemporary Minoan civilization radiating from Knossos in Crete to Thessaly and the adjoining Ægean islands. Five thousand years ago their art, a reflection of mentality, was freer than those of the river races, and continued increasing in vigour until it was overwhelmed, having laid the foundations of the golden age of Greece. In those sheltered waters, local communications were by sea; they could develop in breadth as well as in length, with a corresponding gain in the vigour of the civilization which they helped to produce.

The lack of exterior communications in this area had clearly marked results. Here were three great civilizations co-existing for thousands of years, yet owing little or nothing to each other; they developed independently, as did later those of the Indus and of the Hwang and Yang-tse valleys. Facilities for overcoming physical obstacles to the spread of knowledge were not yet available.

Rome and the Middle Ages.

We have seen how the early civilizations developed mainly in the river regions, but with the Phœnicians, and later with the Greeks and the Romans, a considerable extension came about in the means of communication. Developed at first for trade in the enclosed Mediterranean, ships became more efficient, and vessels equipped with sails and banks of oars were able to navigate not only across the inland sea but along the Atlantic coasts. When the sea-power of Carthage was shattered, the might of Rome was maintained and civilization was spread by sea, aided by that new departure—the Roman roads.

Consider these roads at the zenith of their glory, when the populous cities in the Asian provinces vied with those of Italy, Gaul and Spain in splendour; all these cities connected with each other and with the capital by public highways, issuing from the Forum and terminating on the frontiers of Empire. A great chain of communication extending from the wall of Antonius via Rome to Jerusalem, nearly 4,000 miles in length.* Roads ruled straight, with but little respect for the obstacles of nature, along which posts could travel 100 miles a day, thanks to houses five miles apart with relays of 40 horses each; paved roads permitting the march of legions, central control and freedom of

* 3,740 miles. See Gibbon, "Decline and Fall," Ch. II. This includes two short sea passages, eighty miles in all.

intercourse. Along those roads, the Christian missionaries found an easy passage from Damascus to Corinth, from Italy to the extremity of Britain and Spain; those spiritual conquerors did not encounter any of the physical obstacles which usually prevent or retard the introduction of a foreign religion into a distant country.

We can see in the Roman roads of the past a similarity to the air routes of the future. Aircraft also fly straight, *surmounting obstacles by an easier way*. They provide rapid transportation, and have already played their part in "control." As the highways of Rome, with their two-dimensional communication for the interior of lands, mark an advance on the single line of rivers, so it may prove that the third dimension of aircraft will enable them to build a further stage in the evolution of progress.

Follow now the development of communication by sea, the utilization of the compass to impress a Western civilization on the peoples of the world. The Aztecs and the Incas succumbed to the Spanish seekers of gold, as was inevitable, for their civilizations were local; that of Mexico was confined to the valleys, that of Peru had communication indeed by two thousand miles of road within itself, but not with the outside world. And as in the two early river civilizations, these American races were unaware of each other, and the potato, a staple diet of Peru, was unknown in Mexico.

The European civilization which brought these conquests, inspired in part by the chivalry of the middle ages, had advanced a stage in the "humanization of man." In Asia, a hundred years before the voyage of Columbus, Tamerlane had stormed a Persian city, and made a pyramid of 70,000 skulls; the great empire of the Aztecs believed that it could live only by the shedding of blood, and at one great feast, 20,000 victims died in this fashion: the body was bent like a bow over the curved stone of sacrifice, the breast was slashed open with an obsidian knife, and the priest tore out the beating heart of the still living body. It is true that the very nation who introduced their civilization into America brought with it also their cruelties and the shipment of slaves (whom the English hastened to supply), and gave to Europe the Inquisition under whose holy ægis in the eighteen years of Torquemada's administration alone ten thousand individuals were burned alive.

The Mechanical Age.

So great a change in means of transport has been effected by the transition in gradual stages from an early Nilotic raft to the motor-car and the aeroplane that it is perhaps impossible to realize fully an existence in which many of the chief factors in modern life played no part, or to appreciate the great effect of rapid means of communication on

the problems of material existence. This has been so great that the problems themselves have for the last hundred years ceased to be of that gravity which the men of previous centuries had every reason to recognize. Before that time individuals and states were largely concerned in devising means of securing a margin of safety in respect to life itself.

A people of antiquity whose crops had failed was prevented by the badness and slowness of communications from enlisting outside aid. The Roman Government at the height of its power, with vastly improved facilities as compared with former nations, showed great anxiety for the food supply of that Italy which was dominant in the Mediterranean world. A single case of starvation in the British Isles to-day evokes horror, and yet between the fifth and fourteenth centuries hundreds of thousands of English people perished of famine, or of the diseases attendant on semi-starvation. Within living memory, famines in India and Russia have carried off millions of people, owing largely to the absence of adequate communications for implementing measures of relief, while even now in parts of China hunger and destitution are widespread.

Poverty in the widest sense is an impediment to the advance of civilization. The problem of the world's food supply, the basic need of man, has been profoundly modified by the introduction of steam power into communication by land and sea, and by the invention of the telegraph. In those lands where communications are developed up to the modern scale, universal hunger is to-day unknown, except under circumstances which the advent of war may bring in its train. Meat can be brought from Australia to London for a penny a pound, rice from Rangoon for under a farthing. The markets of the world are available to supply, private and official agencies furnish the means of relief. Not only supply but administration has been simplified.

The novelty of speed may perhaps be better realized by recalling that Napoleon, after the Russian disaster, travelled 1,400 miles in 312 hours. With every conceivable advantage, he averaged under five miles an hour, about the same maximum rate of travel as between Rome and Gaul in the first century A.D. Then suddenly the railways reduced this journey for an ordinary traveller to less than 48 hours; they reduced the chief European distances to about a tenth of what they had been, and made it possible to carry out work under one administration in correspondingly greater areas. The steamship and the cable similarly linked up America with Europe and the East, and the component parts of the British Empire with the mother country; the peculiar bond of our Dominions could hardly have been maintained a hundred years ago.

It seems improbable that this profound enlargement of human possi-

bility was appreciated at the time. An eminent writer* in the first year of the reign of Queen Victoria was of the opinion that:—

"The prospect of travelling from the metropolis to Liverpool, a distance of 210 miles, in ten hours, calls forcibly to mind the tales of fairies and genii by which we were amused in our youth, and contrasts forcibly with the fact that about the commencement of the present century this same journey occupied a space of sixty hours."

Alluding to the possibility of steam communication between England and the United States, the same writer refers to the projected "ships of an enormous size, furnished with steam power equal to the force of 400 horses and upwards" which were about to decide the vexed question whether they could profitably engage in Transatlantic voyages.

In considering the new phase of civilization brought about by the advent of the machine, too much stress must not be laid upon the striking reductions which ensued in the time-distance of one place from another; they were merely one aspect of progress. During the nineteenth century the science of agriculture made quite parallel advances, medical practice and with it the average duration of life improved, modern metallurgy and electrical power were given birth.

The power of the Old World was human power; everything depended ultimately on human muscle, the muscle of ignorant and subjugated men. With the development of machinery, the human being was needed only where choice and intelligence had to be exercised; the drudge, whose brains were superfluous, had become necessary to the welfare of mankind.

Here was a change of primary importance in human affairs; popular education became necessary, and the gulf that had hitherto divided the civilized world into the readers and the non-reading mass became comparatively imperceptible. The spread of knowledge bears fruit in every stage of progress. The development of the aeroplane had to await a certain efficiency of the internal combustion engine, for the improvement of which the need for reliable motor-cars created a demand. The petrol engine could only be made when the science of electricity and metals had improved sufficiently to work raw material in the required way. Even the primitive pumping engine could not develop before sheet iron was available, while the ancient world could not use steam at all because of its metallurgical inferiority.

Motor Transport.

In this brief survey, it is impossible even to touch on numerous factors, technical, social, economic and ethical, which have profoundly influenced the civilization in which we live, nor can any review be

* Quoted by Justin McCarthy: "A History of Our Own Times."

made of divers forms of communication, such as canals, the penny post, electric traction and wireless, all of which play their part in the intercourse of man. Before dealing with aircraft, some thought must, however, be given to the motor-car, since its development is nearly simultaneous with that of the aeroplane, for which on occasion it may be an alternative.

The effect of making mechanical transport universally available has made a change comparable with the introduction of railways; it has created new conditions of living, has stimulated wider intellectual interest and has increased economic activity not only in lands deemed civilized by our present standards, but also among the backward peoples. An example may be taken from the African colonies of France, where Morocco has its 3,000 miles of good motor roads, and French West Africa, that new Brazil, with its 7,000 miles, has been opened up by the motor-car, and order has been established in regions to which Rome never sought to penetrate.

The armoured cars of Great Britain help to preserve the peace in the desert lands, but a more important augury of civilization is the Ford, which conveys the Mahsud and the Wazir to the markets of the North-West Frontier. The Razmak road not only assists administration, as did roads under the Cæsars, but it gives the mountain warrior an opportunity to gain his livelihood by trade; he can now sell his wares, and, for the first time in history, finds his weapons an unnecessary inconvenience; they occupy space in a crowded vehicle, so he leaves them behind.

There are many territories awaiting development when quick transport becomes available. The building of railways is often prohibited by physical difficulties or financial considerations, or by the uncertainty and seasonal nature of the traffic available. Long distance feeders to the arterial railways and waterways are required, but in some countries the construction of roads to carry normal motor traffic is out of the question, owing to cost. The six-wheeler of suitable design, with overall chains, may in certain localities provide a solution, but where mountain, swamp, ice or forest are prevalent, or where as in Central Africa tracks are liable to become impassable for months owing to rain, the limitations of the motor vehicle must be accepted. Some other method must be found to provide that rapid communication on which the nations are founding their scheme of existence.

Aircraft in Peace.

With the perfection of railways and motor traction, there had seemed to be a pause in the increase of human speed, but with the flying machine came fresh reductions in the effective distance between one point of the earth's surface and another.

Since to this quality was added that of being able to dispense with prepared tracks, the visionaries of the world let loose their imaginings, foreshadowing the universal triumph of the air age, but in exploring the fields of the future, the line of demarcation between surmise based on established facts and the prophecies of unbalanced enthusiasm must be strictly drawn.

We must realize that air transport is struggling for its place among other facilities.

It possesses certain advantages which must be weighed against those of alternative means available; it is costly, and will not normally be the only means of intercourse, but will frequently work in conjunction with and additional to communication by rail and by car, by which, indeed, supplies for the aircraft will be provided. It was the railway that enabled Canada, just as it enabled the United States, to expand westward, to market its own and other produce in Europe; it is the railway and the arterial road which now in industrial England cause the expansion outwards of the great towns, as the settlements of Greater London can testify. These means are already available; some new features, inherent in air transport, must be clearly in evidence before the development of air communications can attain its full growth, and it is in those very lands to which the spread of civilization is desirable that such conditions are likely to be found.

We are dealing here with the influence of aircraft upon the development of man. The æsthetic and historical elements of our life, and the magnificent extension of our material knowledge and power, do not themselves form the essence of civilization; this depends largely on the mental dispositions of the individuals and nations that exist in the world. So far as possible, the contribution of aircraft towards that end must be kept separate from their rôle in adding to the *convenience* of mankind. This distinction is sometimes difficult to appreciate, but as an illustration it will be agreed that the spread of education, law and order by means of aircraft among a primitive people is distinct in essential values from the transport by air liner of a business man or tourist from Paris to Berlin.

Air Transport.

The influence which is likely to be exercised by the air lines of the world is too vast a field to be explored in a narrow compass; without entering into those details of routes and miles flown which appear so tedious save to the specialist, it will serve to note that, as might be expected, such lines are of the greatest utility either in countries of great distances, or in those where other forms of communication are slow. The use of aircraft in Russia, and probably later in China, will be an important factor in communication. Of those organized

lines used primarily for the carriage of mails, the French air route along the North-West African coast to Dakar, connecting with ship to South America and thence again by air, is among the most interesting, as an instance of reducing the time hitherto necessary for letter transport.

In the British Empire, which in the opinion of General Smuts is the greatest agency for the advancement of human happiness, the extension of facilities for long-distance transport of men and mails must be regarded as a definite step towards progress, not merely a matter of convenience. For that mixture of growths and accumulations is entirely different from anything that has ever been called an empire before. It has guaranteed a wide security, the "Pax Britannica," and, even more than most empires, it is dependent physically upon communications. Its ways are primarily sea ways, but fresh developments of air transport are now of vital interest. The conversion of Canada, Australia, New Zealand and South Africa from mere administered dependencies into quasi-independent allies was a very fine feat of statecraft; cohesion can only be maintained by free and full intercourse with the mother country, and in the modern world the necessity may well arise when such intercourse must be personal, as between statesmen, and must be quick. If, with the evolution of the airship, the ministers of the Dominions can in a few days be enabled to meet in personal conference with those of Great Britain, and by such means can decide on a united policy, the cause of civilization will have progressed, since one is justified in believing that the representatives of the English-speaking peoples will not willingly embark on a policy founded on baseness. Many times in the course of history has it been proved that misunderstanding is the basic cause of injustice and schism; the facilities for rapid transfer of speech, thought and written word, which the communications of to-day provide with ever-increasing efficiency, are among the principal gifts to civilization of the scientific age.

For this reason, the air route to India, to be extended later to Australia, has a definite ethical value, even though it was inaugurated and is subsidized for strategical reasons, as being useful for the passage of air forces in time of emergency. If aircraft are a power for good, any means for extending their scope of action is also beneficial.

The other great Imperial air route which the next few years will see in operation, from Cairo to the Cape, is entirely different as regards the peoples and lands which it will traverse. After leaving Khartoum, it penetrates countries inhabited, not by the descendants of century-old civilizations, but by the primitive races of man. The degree to which the interior of Africa is new to the white man can be judged by the fact that 150 years ago it was considered that "the Gambia and

Senegal rivers are only branches of the Niger,"* while Central Africa was even more unknown in that period when :—

"Geographers in Afric maps
With savage pictures filled their gaps
And o'er unhabitable downs
Placed elephants for want of towns."†

Physical and climatic difficulties have hindered development; the Cape to Cairo railway, that dream of Cecil Rhodes, seems unlikely to be built because the motor-car and the aeroplane render unnecessary the primary purpose; the produce of the East African countries can more easily be transported by train to the coast. Motor roads through the swamps of the Southern Sudan cannot be constructed, while in the tropical forests vegetation grows rampant over them. Here, then, is scope for aircraft in providing a means of transport; they form a parallel to railways by providing quick communication where none existed before; a landing ground can be kept clear more easily than 100 miles of road, and branch routes from the main airway can be opened up at will. The living instruments of civilization, the scientist and the administrator, can then pursue more easily their tasks for the native in those territories unsuitable for settlement by Europeans.

In Tanganyika, for example, with its thousands of square miles of infested scrub, it is only just that the white man, having introduced one disease, a curse of the country, should eradicate that other, caused by the tsetse fly, which will impartially bring death to cattle and sleeping sickness to man. In the campaign against the encroaching bush, where human habitation cannot be made in face of the fly, perhaps the aeroplane will also serve to make a direct attack, as has been done against the malarial mosquito in trees, even though different methods will be called for to defeat this more stubborn pest.

It is significant that concurrently with the recent idea for an East African Federation, the formation should be suggested of air squadrons to play their part in the projected policy. The reason for their being would not be war, but peace; air communication will prove its worth in aiding that slow building up of tribal organisms or native reserves which should assist in providing the greatest need of the native, a settled life in which there shall be some incentive to self-respecting work and independence.

AIR PACIFICATION.

In two out of the three main territories administered by Great Britain on behalf of the League of Nations, it is noteworthy that air-

* Encyclopœdia Britannica. Third Edition. 1797.
† Jonathan Swift: "Poetry, a Rhapsody."

craft play a predominant part in keeping the peace. Air control has been substituted for military garrisons in order to give effect to the terms of the mandate:—

"To those territories . . . which are inhabited by peoples not yet able to stand by themselves under the strenuous conditions of the modern world, there should be applied the principle that the well-being and development of such peoples form a sacred trust of civilisation."*

It is the privilege of the Royal Air Force to have assisted in fulfilling that trust. Even though the ideal be sometimes obscured, it is on a far higher plane than the hypocritical cry of "the white man's burthen" which accompanied the international land-hunger leading 50 years ago to the partition of Africa among the nations of Western Europe.

The methods by which aircraft maintain the peace on the borders of the lands of the Middle East need not be discussed here. The advantages of rapid movement by air, quick concentration and action, and of economy as compared with any other method of preserving law and order are so great as to warrant the employment of aircraft; their method of retribution is humane, since it operates chiefly by moral effect and not by the taking of life. The raiders do not find it easy to bring about a surprise, and still more difficult to escape with their loot; the avengers can follow fast.

The result in Iraq to-day is patent to all; the border country is quiet; murder and robbery have ceased, since they no longer pay; the Kurds, whom the centuries have never tamed, are becoming a peaceable folk.

On the Indian Frontier, where physical conditions are so different, the same result is drawing near. We have seen how the motor-car and the road play their part in achieving the desired end, but roads are expensive and take years to build; the predatory spirit of the tribes must be checked before the machinery of civilization can be installed.

Until ten years ago, the problem of the Frontier was very little different to that in 1877, when Lord Lytton wrote:—

"Our North-West Frontier presents at this time a spectacle unique in the world. After twenty-five years of peaceful occupation, a great civilized power has obtained so little influence over its semi-savage neighbours that the country is a 'terra incognita,' and there is no security for British life a mile or two beyond our border."

But now a new factor, the aeroplane, has been introduced.

"Here [on the Frontier] flying seems natural; the whole face of the land is so broken and heaped up, the valleys so deep and the moun-

* Article 22, Covenant of the League of Nations.

tains so high, that only on wings can one move about without infinite toil and labour."*

By those wings not only was a tragedy at Kabul averted, but the routine of administration on the Frontier is made more easy; the "unknown land" is yielding up its secrets, and the wild men are succumbing to influences hitherto unknown.

The most ardent pacifist will hardly dispute that to allow the evolution of progress, order must be maintained and massacre subdued; the civilization of a state can in part be judged by the efficiency of its police; on the borders of our lands, where there is a threat by warlike but backward races to whom reason and parley have but little appeal, it is equally necessary to provide a corresponding protection by means of the armed forces of the Crown. It is the peculiar property of air forces that they can achieve this purpose with no legacy of hatred, and with a minimum of suffering to man.

The influence on semi-civilized races of personal intercourse, as contrasted with the written word, is well known. By air communication, the political administrator is often enabled to meet face to face some tribal chieftain with a grievance where previously no such interview could be held in time to avert a petty rising. Misunderstandings can be cleared away, ills redressed on the spot, and bloodshed averted. In Iraq, India and the Sudan the action of aircraft in this promotion of the freedom of intercourse has been among their most valuable features.

These aspects of the influence of aircraft might perhaps be regarded more as a convenience than as furthering the cause of progress, since undoubtedly they would not be used unless their economic value for the purpose had been clearly shown. If, however, poison gas or bacterial cultures were found to be an equal deterrent against brigandage, and even cheaper than the present method of policing by air, no case could be made out for using them in the cause of civilization; the recoil of the mind from such an application of modern science is a true indication of its inherent wrong.

Air Survey.

Air Survey is almost the only form of aviation which is a commercial success, since it can operate at a profit without subsidy. The successes of the past have made possible the development of the immediate future in the mapping of uncharted lands. In the British Empire alone two big air surveys are now in progress, 63,000 square miles in Northern Rhodesia, 20,000 in the Sudd country of the Sudan. These are being carried out by air because of the saving of time and money, but the result will be an increase in human development.

* Sassoon : "The Third Route."

Maps have ever been among the criterions of man's knowledge; from the crude plans of the early Egyptians to the maps of ancient Greece, the science progressed as knowledge grew. During the period from Ptolemy (c. 150 A.D.) to the Renaissance, there was a lull in the increase of scientific and artistic achievement, and cartography was also dormant, to rise again and grow to its present utility as a necessary factor in our modern life. It is in those regions which are inaccessible to civilized man that air survey is likely to be most useful, and although the primary object of such work may be to increase the productivity of the forests of the Irrawaddy delta, or of the oil-bearing regions of the Orinoco, yet a step has also been made towards facilitating communication and administration in districts inhabited by comparatively primitive people.

The forest and fishery air patrols of Canada, air ambulances in Iraq, Morocco and Sweden, insecticide spraying by aircraft over crops in America, the discovery from air photographs of mineral regions and of the sites of works erected thousands of years ago, all contribute to progress. In Polar regions, aeroplanes in the recent Antarctic expeditions have provided the means of reconnoitring thousands of square miles of territory which the difficulty to surface movement would hinder; airship routes across the Arctic may in the future prove quicker than trans-oceanic ways, and accelerate development of the northern lands; aeroplanes with skids can in skilled hands land at will on drift ice, hundreds of miles from land, and the crew can, if necessary, live by hunting for months at a time until the settlements of man are reached.* It is conceivable that our knowledge of meteorology, that significant factor in human affairs, may profit greatly by air observations in the Arctic circle.

Civilization, from whatever aspect it be considered, cannot be founded upon ignorance; the more complete an understanding we possess of the mental and physical factors affecting life in this world, the more likely are we to advance. If the only contribution of aircraft were the limited one of serving as an aid to the geographer, that alone would justify their existence.

Aircraft in War.

"The British Air Force exists partly for the purpose of attacking with bombs, poison gases or disease germs the crowded white populations of industrial cities . . . for terrorising whole peoples with the most frightful form of warfare yet invented by man's genius. . . . If war is to remain legal, let us prepare the most devilish devices for the

* Stefansson, "Geographical Journal," November, 1929, and Wilkins, "Flying the Arctic" (New York, 1928) claim that a pilot fully experienced in Arctic conditions, such as Eielson, since killed, can land every five to ten miles on the ice and in an emergency walk ashore, even though the journey takes a year.

wholesale murder of our enemies, and let us recognise the moral bankruptcy of our so-called civilization."*

Although this sentiment may be regarded as extreme, the possible influence of aircraft in war as a de-civilizing factor cannot be ignored. It is indeed only one aspect of the larger question as to whether war as a means of settling disputes is inevitable, and whether the weapons of war, if they cannot be abolished, can be limited in regard to the ruthlessness of their action.

It will now be generally conceded that it were better if the purpose of civilization could be attained without so drastic a means of combat. The signature of the Pact of Paris, condemning recourse to war for the solution of international controversies, and renouncing war as an instrument of national policy, expressed truly the opinion of the majority of peoples.

Since the right of self-defence, which may be interpreted as the assertion of vital interests, is, however, clearly understood to be retained,† the instruments of such action, namely, armed forces, must also in a measure be retained, and the prospect of using them, though diminished, still survives.

It is conceivable that a great war might arise if the advanced nations of the world were threatened by vast hordes of a more barbaric race. In the mechanical war of to-day, those states more advanced industrially would be best situated to utilize aircraft; consequently total disarmament or cessation of endeavour to discover how best the air arm can be utilized in operations might prove an invitation to possible disaster. If this defensive rôle of aircraft can be distinguished from their employment in a war of aggression, the interests of civilization will be served, but, as all the world is aware, it is just this very distinction which has proved so serious an obstacle to agreement as to reduction or limitation of armaments.

If war as a whole cannot now be ruled out as a possibility in international affairs, still less can the utilization of aircraft in war be arbitrarily prohibited. Bayard, and the chivalry of the Middle Ages, could not postpone the introduction of gunpowder, and the proposal to illegalize air fighting also breaks down because the aeroplane is useful in peace. The use of commercial aircraft and pilots at the outbreak of war would stultify the abolition of military air forces, while further aeroplanes would be rapidly built and young men trained to fly them. Where the essential interests of a nation are concerned, it is difficult to decide by agreement as to the strength of air forces allowed, since there is not the same compelling motive of economy which has brought about reductions in naval armaments.

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* Kenworthy: "Will Civilization Crash?"

† See American Note accompanying the final draft of the Treaty, April, 1928.

The difficulties attending the absolute prohibition of war, of aircraft as weapons of war, and of limitation of air forces, are, however, far greater than those which aim at limiting the brutalising effect of weapons, and herein lies the main prospect of success under present conditions in reducing the devastating potentialities of air war. Although it has been affirmed that necessity knows no law, yet the action of belligerent states will continue to be governed by expediency. Violation of covenant by Germany had the effect of bringing about the entry into war of the British Empire immediately after the invasion of Belgium, and of the United States after the unlimited submarine campaign. In view of the feeling now prevalent among the Great Powers, it is certain that formal agreement by treaty provides a strong deterrent against violation of that code.

Because the Germans used poison gas in defiance of convention, it is unreasonable to deduce that no conventions should be made for rendering war more humane, or that, if such agreements are reached, they will never be observed. Such an argument ignores the fact that during the late war, in accordance with civilized usage, a surrendering enemy was not normally killed, nor tortured in order to extract information; civilians in captured towns were not ravaged, nor their property wantonly destroyed; undefended coastal towns did not usually suffer bombardment, and hospitals were so far as possible left undisturbed. Many of the provisions of The Hague Convention were observed, and there is reason to hope that the Geneva protocol extending the prohibition of poison gas to all bacteriological methods of warfare will act as a check on the initiation of these means of warfare. The laws of air war, drafted by international jurists at The Hague, have not yet been ratified, but agreement as to the main principles involved cannot be long delayed, and will form a basis on which to limit the widespread destruction of human life which would follow upon unrestricted air war.

Moral factors, such as treaties and conventions, are not primarily the affair of the professional fighting man, by whom, indeed, their value is often contemptuously ignored; it is his business to prepare for war, but, in considering the broader aspect of civilization, it is apparent that the importance of moral factors may far transcend some technical invention, such as a new means of rendering the aeroplane a more deadly weapon of destruction.

We have traced in outline the influence of communications upon progress in civilization; a similar comparison could be made showing the relation between civilization and war. In primitive societies, the home develops into a group, and later a walled town with a ruler and a body of armed men is formed. This is the beginning of the State, whose object is to provide security. The armed citizens of the Greek

city states gave way to the legions of Rome; the armies of feudal nobles in the Middle Ages were absorbed in those of nations; it is now the nation or the empire on whom the responsibility for security has developed, and it is the whole population of that nation who wage the war, not merely the professionals who in peace form the nucleus of a war-time expansion. If security can be surely attained by means other than war, the purpose of civilization is fulfilled, and although the abolition of war must necessarily be slow, the feeling of the world is changing more rapidly than some sceptics allow. When Mussolini declared* :—

> "Italy must arm, must be able to mobilize five million men and to arm them . . . Our Air Force must be so numerous that the surface of their wings must obscure the sun over the land"

he was voicing a sentiment which is growing archaic; when such a speech can be regarded with amusement, and not with admiration or fear, the peaceful influence of aircraft will overcome the obsession due to their possible powers in war.

It will be clear that in discussing aircraft in war, reference has been made to organized war between civilized states; their civilizing influence in such a contingency is obviously non-existent. There is no need to consider whether or not a bomb or poison gas is more or less merciful than a high-explosive shell, or than starvation by blockade; the negative value of all these as a means of furthering progress in the broadest sense seems to be evident. No one who has cowered on the ground listening to the whine of a falling bomb can have felt that this aspect of scientific civilization was ennobling; it is a contradiction in terms, but so indeed is the inscription on the Victory Medal of 1919—"The Great War for Civilization." Although mankind is but little older now than it was then, it is improbable that so ironic an epitaph could be seriously accepted to-day.

Aircraft in the Future.

On the British race lies a responsibility greater than has been laid on any other country, for not only must we learn to govern ourselves, under the recent condition of universal suffrage, but we have to show many races alien from us in language and tradition, old in their culture, how to apply our methods of self-government to their own peoples. To us are looking the indigenous inhabitants of Africa, confident of our power to give them justice, and to help them to rise in the scale of civilization. Meanwhile the world is contracting, and scientific invention, by flying, by wireless, by the motor-car, by films and by gramophone is jostling the nations of the world together.

* Speech on May 27th, 1927.

Whether these things will make for the elevation or degradation of mankind is for us, who now live, to determine.

Science can be devastating, and mankind may be its slave. Human nature is infinitely elastic, docile to a degree, as the Great War testified. For five years Europe lived suspended in mid-air, and became adjusted to it. The man in the street allows his peace to be snatched from him by a whirl of motor-traffic; without a groan he is packed like a herring in underground trains, but it is surely not desirable that we should stand idly by, and see our sky blotted out by droning devils, called into existence by this latest achievement, the conquest of the air. We must see that aerial development is a servant and not a master. If the joy of motion and the thrill of speed result in making our lives intolerable, the net result is a loss, not a gain, to man. If aviation is to be a blessing and not a menace, steps to ensure that end must be taken before it has become too late.

Apart from this aspect of flying as it may come to affect the urban dweller, there can be little doubt as to the benefits which aircraft developed on the right lines can bring. We have indicated the value of improved forms of communication in the spread of civilization, and in particular the advantages which air communications should bring to the British Empire when the three-dimensional way supplements surface routes by land and sea. There is a broader aspect. By the nature of their motion, aircraft can pass over the arbitrary land frontiers of states without recognizing their existence; customs barriers and fortifications are alike ignored from the air. It seems impossible fully to develop this gift of unrestricted movement without a world control of the airways; freer communication of nations, and international agreement facilitating the passage of aircraft over the jealously guarded confines of states may perhaps slowly help to break down that atmosphere of mistrust between peoples which tends to retard progress.

We cannot tell. Human history becomes more and more a race between education and catastrophe. Against the unifying effort of Christianity and against the unifying effort of the mechanical revolution, catastrophe won. New calamities may arise from the misuse of the air, but clumsily or smoothly the world progresses and will progress. Even though this new invention may make it possible for one man by a single movement to kill not many a hundred, but ten thousand fellow men, it is difficult "to avoid becoming ruinous to one another by economising a physical power. At best the result is that the oppressor and the oppressed exchange rôles. The only thing that can help is that we renounce the power which is given us over one another."* Such renunciation may perhaps be effected by mutual

* Schweitzer: "Civilization and Ethics."

agreement as to the methods of destruction permissible in war, or, more ideally, by renunciation of war itself.

Aircraft in peace present a sufficiently strange anomaly. Flying machines carry men to-day through the air over a world in which hunger and brigandage have a place. It is not only in China that one recognizes the grotesque character of such progress, it is almost typical of mankind in general, and can only be changed by bringing order into the chaos of human life. There is to-day an opportunity to utilize aircraft as an influence for the benefit of man; the potentialities exist, and if only we can make right use of them, far-reaching results may ensue.

It does not suffice nowadays to allow a new power to pursue its course unrestricted and undirected; it may become too dangerous an animal, and may become a Frankenstein monster to destroy its creator. It seems incredible that, after the next air war, civilization should be represented by a Bert Smallways grubbing for roots in the Weald of Kent, but a far less cataclysm attending the use of aircraft as a military arm might more than neutralize the benefits which they had hitherto contributed to human progress. Only by developing to the fullest extent air communications and the pacific rôle of aircraft, and by restricting or abandoning their power for destruction in war, can the invention of flying take its proper place among those influences leading to a higher civilization.

THE "GORDON-SHEPHARD" MEMORIAL PRIZE ESSAY, 1929

SUBJECT.

"Discuss the part which armoured and/or armed but unarmoured vehicles should take in the air control of an undeveloped country; their tactical employment, the types of vehicle and equipment which should be developed for this duty, and the training of the unit."

BY WING-COMMANDER W. A. McCLAUGHRY, D.S.O., M.C., D.F.C., *p.s.a.*, R.A.F.

Motto: "Mens Agitat Molem."

THE success of air control of Iraq demonstrated in no uncertain manner the manifest advantages of such control of undeveloped countries. Since that success was so amply proved the Royal Air Force has gradually but steadily increased its responsibilities in so far as those branches of its activities are concerned, Palestine, Trans-jordania and Aden having been added to the list, and it is only a question of time before still more countries are brought under air force control.

The chief advantages of using aircraft for such work are, first, their undoubted economy, and secondly, the rapidity with which operations can be brought to a successful conclusion.

It has frequently proved possible for aircraft alone to exert the necessary moral or material pressure required to deal with a particular situation. On the other hand it has often been found necessary to support air action by force in some form on the ground. Quite apart also from the employment of ground forces of some sort on active operations in conjunction with aircraft, ground forces or vehicles are required, as will be illustrated in some detail later, in order to enable aircraft to develop their maximum power.

Whenever possible, of course, aircraft used alone provide the most speedy and economical, and therefore also the most efficient means of achieving results. The adoption of such a course also ensures that an opponent is not provided with anything tangible to attack, except in the unlikely event of a forced landing.

Unfortunately, more often than not this ideal will prove impossible of achievement and some ground force will be required. The form

which this force will take, the duties upon which it will be employed and the types of vehicle which are likely to be most suitable depend upon a variety of changing factors.

1. Previous Methods of Controlling Undeveloped Countries.

It is unnecessary to elaborate at any length the obvious disadvantages of the methods of control which were in force prior to the development of the air arm. The necessity for and disadvantages of placing isolated detachments in places where they were likely to be overcome before the arrival of relief, the employment of columns of troops when trouble did occur, with all the complications and the expense of supplying and maintaining such a force, often in waterless and malarial territories occupied by hostile tribesmen, do not require any amplification here, as they are now very fully appreciated.

The use of such forces provided just that opportunity for a fight and for loot which the natives of most of the countries concerned regarded almost as the breath of life, and might often have, therefore, acted as a direct incentive to cause trouble. Those methods are now obsolete, and there is little doubt that operations such as those carried out since the Great War, in Somaliland, Iraq, Transjordania, Aden, the Sudan, and even on the North-West Frontier of India, would not have been attempted but for the fact that aircraft enabled them to be brought to a successful conclusion quickly and economically.

2. Limitations of Aircraft.

Aircraft working alone are subject to certain serious disadvantages. They can usually only be employed effectively from secure bases, and with the support of assistance on the ground, though that assistance will usually be of a passive nature.

The fact must always be borne in mind that weather conditions may be such as to interfere with the operations of aircraft, or even to stop them completely for considerable periods. Sometimes this may not be important, but there will frequently be occasions when continuity of attack is important and failure to maintain the pressure may have unfortunate results.

Another disability of aircraft is the difficulty of their reaching and inflicting punishment in a direct form on natives who live in inaccessible places, in mountainous country or in swamp. In most of these instances, however, the desired result can be achieved by indirect methods, such as destroying crops and flocks and interfering with their normal lives until they are prepared to capitulate.

The problem of internal security in towns and other thickly populated districts is probably the most difficult situation which an air

commander could be called upon to face, and one where the employment of aircraft alone would be quite inadequate. The recent outbreak in Palestine provides a typical instance of this difficulty. Aircraft could only be employed in a limited manner, owing to the impossibility of allowing offensive action to take place indiscriminately from the air at Jaffa, Jerusalem, and other towns and villages.

On those occasions aircraft can only be employed with great discretion for such purposes as demonstrations, reconnaissance, and for the attack of certain objectives which ground forces have definitely established as being occupied only by malcontents.

From the foregoing, therefore, it is apparent that pressure which can be brought to bear by aircraft cannot always be continuous and may require to be followed up on the ground. While devastating results may be inflicted at intervals which may be frequent or infrequent, some mobile form of ground force will nearly always be required to reap the results of air action.

3. Definition of Air Control.

It will perhaps be well at this stage to obtain a clear picture of what is meant by air control, and to outline very briefly the different means by which this control may be achieved.

Under that system of control aircraft are used as the primary arm and the minimum possible use is made of force in any other form.

From the point of view of an air commander it would be ideal if he could always achieve his object by the use of aircraft alone. There have been many instances where this has been possible, but the fact must be faced, however, that usually terms have to be arranged on the ground, and therefore personal contact must be established with the native occupant of the territory being administered.

When working in close co-operation with aircraft the personnel on the ground can be reduced to a minimum, and may quite often consist merely of political and intelligence officers conveyed to the seat of trouble either by air or by any other means.

On occasions it may even be desirable to transport a small force of troops or police to any desired place by means of aircraft. When this is considered to be neither convenient nor desirable, armoured or armed but unarmoured cars may serve the purpose of bringing pressure to bear on the ground, and as a means of reaping the fruits of air action.

There have also been occasions when a small force of levies or even friendly natives have been used to follow up air action and to occupy villages or positions which have been evacuated as the result of bombing operations.

The last and least desirable course is to employ a column of troops to

support air action, although the occasions when troops would now be employed in this manner should be very rare.

The need for speed in inflicting punishment or carrying out a demonstration is all important, and therefore the ground force operating with aircraft must possess maximum mobility. This practically rules out the possibility of using the column, which is slow and expensive, difficult to maintain, and vulnerable.

Armoured cars or armed fighting vehicles fulfil all requirements in regard to mobility, and are also economical and can dispense with vulnerable lines of communication.

4. Functions which Vehicles are Likely to be Required to Perform in Conjunction with Aircraft.

(a) Internal Security.

The employment of armoured cars in connection with internal security problems has already been touched upon. The importance of this aspect of armoured car work cannot be overestimated, as aircraft unaided will never be able to undertake the duty, which is essentially of a police nature.

(b) Active Operations.

It can be taken for granted that under the conditions which we are considering, armoured cars or other vehicles will only be required when acting offensively to operate in close co-operation with aircraft, which will mean that their work will be much easier than would otherwise be the case.

After a place has been subjected to air action, the mere appearance of armoured or even armed cars will more often than not be sufficient to ensure compliance with orders, so that usually, therefore, even when employed on active operations, the effects produced by armoured or armed vehicles will be more moral than material.

The cars will be employed to reap the fruits of air action, to convey political or intelligence officers to the seat of trouble to arrange terms, and to police those places as long as may be necessary.

On the few occasions when armoured cars are required to show force their armament and mobility is sufficient to overcome the resistance likely to be offered, particularly as they will be able to rely on the assistance of aircraft at short notice.

It is important, however, that when cars are employed they should be in sufficient numbers to guard against unfortunate incidents; they should know the country in which they are working and should be in close touch with the aircraft base or advanced base, or with aircraft in the air, by means of wireless telegraphy, throughout the operation.

(c) *Guarding Advanced Landing Grounds.*

In order to obtain maximum efficiency from aircraft it is frequently necessary to establish advanced landing grounds, either with the object of increasing the radius of action of the aircraft or of increasing the number of raids which may be carried out by any given number of aircraft, as a result of reducing the distance which they have to fly. These advanced landing grounds have to be guarded, and while military guards may be expected to be provided whenever possible, and while this duty has frequently been undertaken by police in the past, it will often be found desirable or necessary for armoured or armed vehicles to do this work. The type of vehicle to be employed must, of course, depend on the nature of the country, but, given suitable conditions, armoured cars will be used for preference, though they will, of course, be accompanied by attendant carrier cars. Certain work may also be required on these grounds before they are suitable for the required purpose, and while whenever possible native labour will be used, it may occasionally have to be undertaken by the car crews or by other men transported for the purpose.

(d) *Conveyance of Stores.*

When advanced landing grounds are established, it will be necessary to provide certain stores and equipment on those grounds. Fuel, bombs, ammunition and spare parts of various descriptions, to mention only a few items, will have to be transported, often for considerable distances, through hostile or potentially hostile country.

It may occasionally be convenient to transport such stores by air, and it is obviously highly desirable to do so if possible. Suitable aircraft, however, may not be available for the purpose, and the stores may have to be conveyed on the ground. For this purpose vehicles suitable for the transport of stores are required, together with others, armoured or armed only, for escort purposes. The six-wheeler has proved equally suitable for the transport of stores under almost any conditions, and, when suitable mountings and guns were provided, as a fighting vehicle for escort purposes.

(e) *Reconnaissance and Showing the Flag.*

The value of demonstrations by aircraft as a means of quickly showing our hand in a delicate situation has often been proved, and similar demonstrations by cars will frequently be necessary. On these occasions political officers may be carried, who can get into touch with local inhabitants, and very often a favourable impression may be created by using wireless telegraphy to arrange for aircraft to appear at a given place and time, having informed the local inhabitants of what they may expect to see.

Advantage may also be taken of these occasions to reconnoitre suitable sites for advanced and emergency landing grounds. Suitable sites for these purposes can, of course, usually be located more easily from the air than by any other means, but when possible sites have been found in that way, an examination on the ground will usually be advisable.

(*f*) *Salvage of Forced Landed Aircraft.*

While it will often be quicker and more convenient for salvage work on forced landed aircraft to be undertaken by air, than by any other means, when the forced landed aircraft is capable of being repaired or rendered serviceable on the spot, the nature of the ground will frequently make it impossible for another aircraft to land near by with safety. This will necessitate the sending of the required assistance and any spare parts by means of ground transport, accompanied, if thought necessary, by a suitable escort—or, failing that, the cars conveying the stores may be armed.

As will be indicated later, after the provision of six-wheelers in Aden, salvage operations which had previously taken as long as a week to perform by means of camel transport could be completed within forty-eight hours, with much greater efficiency and with the minimum of fatigue to all concerned. This is regarded as almost the most important function of the type of car which may be used either for transport purposes or as an armed vehicle.

The six-wheeler has performed this and the other duties mentioned above with an efficiency that has not been equalled by any other type of vehicle, and, when they were provided, duties which had previously been found to be an intolerable burden were merely regarded as interesting experiences.

5. The Effect of Different Types of Country on the Vehicles to be Employed.

The type of vehicle which is likely to prove most suitable is governed very largely by the nature of the country and the surroundings in which they will be called upon to operate, and the effect which those conditions are likely to have, not only on the vehicle but also upon aircraft, which must usually be regarded as the primary arm.

It is not proposed to consider the tank, because its comparative immobility makes it unsuitable for employment in close co-operation with aircraft in the sort of operation being considered, and it is thought that tanks will therefore not be used except in operations where troops are employed and where speed cannot be considered as of great importance. Moreover, the tank is designed to fulfil certain needs in a major war which call for great defensive and fire power, combined with the

ability to surmount natural and artificial obstacles, and such a vehicle is therefore not often necessary in undeveloped countries.

In towns, villages and thickly populated areas, wrongdoers can only with difficulty be distinguished from peaceful inhabitants. India probably provides the most typical instances of these sorts of areas, although they occur in all the countries at present under air control.

The use of aircraft in such localities must be most carefully controlled, and they can then rarely be allowed to act independently of ground forces.

Too great emphasis cannot be laid upon the fact that this problem provides the most difficult possible conditions for the employment of air forces, which can then only be used in conjunction with some form of ground force.

These conditions, however, will almost certainly ensure that roads or tracks will exist upon which heavily armoured cars, of the Rolls-Royce type, can operate. The necessity for working in narrow streets and confined spaces where fire and possibly bombs may be expected from close range, and from almost any direction, makes it imperative that the type of vehicle used shall provide the maximum protection for the crew. It can safely be assumed, therefore, that under those conditions protection is of greater importance than mobility, which means that the armoured vehicle employed should be of the Rolls-Royce type, which has already been so successful in Iraq and other places.

The employment of an armoured vehicle also tends to produce a much more satisfactory moral effect than could an unarmoured vehicle of any description; it conveys an impression of great strength and power to the simple native mind. There is one very obvious weakness, however, of all cars which have to operate in undeveloped countries, and that is the pneumatic tyre, which constitutes probably their most vulnerable feature, and the matter of providing better protection for the tyres, or possibly some form of self-sealing tyre, not affected by rifle fire, should receive consideration. Failing any other solution of the problem, it is worth investigating whether some form of spring tyre, such as has already been tried out experimentally, might not be used.

Owing to the difficult nature of the country which has frequently to be traversed, and to the amount of low gear running which is necessary, the water contained in radiators is often at a high temperature, and it is by no means unusual for water to boil for considerable periods. This results in loss of water, which has to be replaced from the very limited supply carried, and the difficulty could be overcome by fitting condensers similar to those used by the Nairn Transport Company on their Cadillac cars. These condensers have proved to be a great success, and enable considerable distances to be covered by

heavily loaded cars, in the summer months, without the necessity for frequently refilling from the limited reserve which can be carried.

Apart from the conditions already mentioned, the other types of terrain in which vehicles will be required to co-operate with aircraft may include all or any of the following:—

(*a*) Hilly or mountainous country,
(*b*) Desert or open country, including soft sand,
(*c*) Wooded country,
(*d*) Swamp,

and it is obvious that the same type of vehicle is not likely to be equally efficient under all those varying conditions.

On some occasions it will be possible to use the standard armoured car as we know it at present. It would be an advantage if we could always do so, because its presence produces a most desirable moral effect and it also provides a high degree of protection for its crew, together with considerable fire power.

Even when armoured cars are used, however, if they are to be self-contained and carry all the equipment and supplies which are necessary for an operation lasting possibly for several days, some form of tender or carrier must be provided for the purpose of carrying the equipment which will not go into the armoured vehicles.

Under certain conditions, also, in the absence of roads or of a hard ground surface, the armoured car will become either partially or completely immobile, and it is therefore necessary to provide another type of vehicle which, while being armed, also possesses the maximum possible degree of mobility under all likely conditions. This latter consideration probably precludes the use of any special protection for the crew in the shape of armour.

Different types of vehicle have been tried out for this purpose and have met with varying degrees of success. The six-wheeler has successfully passed most extensive trials under very difficult conditions, and should prove an excellent vehicle for the purpose. This car is also provided with tracks which may be fitted to the rear four wheels when required to traverse exceptionally difficult ground.

Experience in the hinterland of Aden has shown that in the soft sand which is prevalent there, the six-wheeler can make progress when no other vehicle can move. The movement was sometimes extremely slow, but no sand, however soft, was found which completely barred the progress of the six-wheeler.

On one occasion two six-wheelers in Aden took nearly 48 hours to cover about 60 miles over soft sand to a forced landing, over ground which was previously thought quite impassable for wheeled vehicles, and no breakdown occurred to the cars. They were very heavily

loaded, carrying, amongst other things, a complete Liberty engine. Even so, it was not found necessary to use the tracks.

The drivers on that occasion possessed only limited experience, both of the country and of driving under the most difficult possible conditions. With further experience there is little doubt but that this early performance could be considerably improved upon.

As a contrast to that experience, prior to the arrival of six-wheelers, cars only were available for desert salvage work and ground was frequently found which barred their progress. On one occasion an engine, shear legs and other equipment, having been taken to within about 15 miles of a forced landing by car, it could proceed no farther. The engine had then to be completely dismantled and it and the other equipment made up into camel loads. Having traversed the remaining fifteen miles by camel, the engine had then to be assembled amidst soft drifting sand and mounted in the aircraft; the unserviceable engine, having been taken out, was dismantled and returned by the same primitive means. The whole operation took approximately one week and demanded a vast amount of effort. This difficulty can now be overcome by the provision of six-wheelers.

The experiences in Aden are quoted in preference to any others because it is thought that that Protectorate probably provides the most difficult conditions in which cars are likely to have to work. Vehicles which are suitable there are not likely to fail anywhere else.

The conclusion is therefore arrived at that two types of vehicle are required in order to compete with Royal Air Force requirements, one the standard Rolls-Royce type of armoured car which has been used with such success in Iraq, Palestine and Transjordania, and secondly the cross-country vehicle of the six-wheeler type, which may be used either as a carrier or as an armed vehicle, and which is designed to provide maximum mobility under all possible conditions. The advisability of providing some form of light protection for the crew of the latter is a matter for consideration, but this must on no account be allowed to reduce its mobility.

6. Armament.

The armament of both the types of car recommended may consist of Vickers or Lewis machine guns, or possibly a light one-pounder gun.

The Vickers gun has been found to be most suitable for the armoured car, and the Lewis gun for the six-wheeler.

A Vickers gun might be fitted to the six-wheeler, but if that were done a special type of mounting allowing for an all-round traverse would be required. The Lewis gun, or rather two Lewis guns are more easily mounted and used on that type of car, the mounting, even

when in place, not interfering with the use of the car for purposes other than fighting.

The Lewis-gun mountings can be fitted either in the back of the car (one on either side), which allows an arc of fire of not less than 180° behind, or to fire over the driver's seat in a forward direction, which allows again an arc of fire of about 180° in the direction in which the car is facing. Both types of mountings have been tried and have met with some success.

Apart from the guns which are actually mounted upon armoured and armed cars, a number of ground Lewis guns, with appropriate mountings, should always be carried, normally on the scale of two per vehicle. These additional weapons will often prove an invaluable addition to fire power for use when cars are stationary.

The difficulties of installing a one-pounder gun, combined with the difficulty of maintaining an ammunition supply, tend to rule it out. An even more important consideration is that the type of target which is likely to be presented will almost invariably be more suitable for the employment of a machine gun than a one-pounder. Rarely would an opportunity occur for using such a weapon effectively.

7. Equipment of Vehicles.

The armoured or armed force provided requires to be equipped on such a scale as to be completely mobile and self-contained. The following are considered to be the chief items of equipment which should be carried, though it must also be borne in mind that the needs of cars can always be provided for by means of aircraft. The required stores and equipment can either be dropped by means of parachutes, or, alternatively, when suitable landing places exist, the aircraft may land.

(*a*) *Armament.*

The gun armament has already been dealt with in para. 6, and for these weapons a suitable supply of ammunition, together with a reserve and spare parts for the guns, must be included.

Light bombs of the Mills type, or possibly even containing tear gas, will also be found to be a most useful weapon for employment under certain conditions, and they should therefore always be carried.

Rifles and pistols are necessary on a scale sufficient for the crews. These may be required for emergency purposes, and will also be needed for arming sentries at night and when cars are parked for any reason. Rifles are required for airmen and pistols for officers and N.C.Os. of and above the rank of sergeant.

(*b*) *Wireless Telegraphy.*

It is essential that wireless telegraphy should be carried by each force of cars, whether operating alone or in co-operation with aircraft. If

possible, wireless telegraphy should be arranged so that it can be operated when on the move, and there appears to be no good reason why this should not be done. If fleeting opportunities are going to be lost, constant watch must be maintained, and it is therefore not sufficient to arrange for speedy erection of the set after cars have stopped.

The need for the provision of a spare wireless telegraphy set during important operations should not be overlooked.

It is for consideration also whether on occasions a form of direction-finding apparatus might not be carried by the cars in difficult country, with the object of directing aircraft.

Tests on these lines have been carried out in Transjordania and met with considerable success, a pilot who was unacquainted with the country being directed from Amman to a small car force which was located in the desert at a distance which necessitated a flight of nearly two hours' duration. The procedure was simple and merely consisted of the aircraft sending its call sign, the bearing of which was plotted by the car direction-finding apparatus, and the pilot was then given a course to steer, which was frequently checked and revised.

(*c*) *Salvage Equipment.*

Owing to the arduous nature of the work required to be performed, certain apparatus will be necessary in order to surmount natural and other obstacles.

For this reason towing gear should be carried, in order that vehicles may assist one another in the event of its becoming necessary to do so, and some form of light bridging material should also be provided to assist movement across wet or swampy ground and possibly also as an aid to crossing ditches and small streams. In difficult country the six-wheeler may often be able to give considerable help to Rolls-Royce armoured cars, which might otherwise find their progress barred.

(*d*) *Aircraft Equipment.*

Co-operation with aircraft necessitates the provision of certain special items of equipment, as follows:—

(i) A Supply of Very pistols and various coloured lights.
(ii) Message picking up apparatus and a supply of message bags.
(iii) A small heliograph or mirror.

In Iraq this was found to provide a most effective means of attracting the attention of occupants of aircraft to other aircraft, cars or persons on the ground. The light reflected from the mirror requires to be trained on the aircraft, and by this means it was often found possible to attract attention at distances of more than five miles.

(iv) A supply of ground strips or other means of passing messages or of marking out a landing ground and indicating bad ground.

(v) Medical equipment for ordinary use and for emergency purposes.

(vi) Smoke bombs or an easily transportable form of wind indicator for use on advanced or emergency landing grounds.

(vii) It must also be remembered that engines' shear legs and other equipment necessary for changing an engine in the open may have to be transported by car.

(*e*) The vehicle must, of course, be self-contained in so far as a supply of tools, spare parts, extra fuel tanks, reserve rations and water containers, both for drinking purposes and for use in radiators, are concerned. They should have a radius of action of not less than 150 miles, be rationed for a minimum of four days, and it goes without saying that cooking utensils are required.

It is important that loading tables should exist and that they should be frequently checked and revised. It was only quite recently that an unfortunate incident nearly occurred abroad, owing to carelessness in checking emergency rations before a journey was undertaken.

The weight carried on cars should receive careful consideration, as overloading will often result in breakdowns. It is better to increase the number of vehicles in the convoy than to overload.

8. Training.

In countries which are controlled by the Royal Air Force it is essential that the armoured or armed car force should be provided, manned and maintained by Royal Air Force personnel, a proportion of whom at least shall have had flying experience. This applies more particularly to the officers and N.C.Os.

The best results in operations during which vehicles on the ground are required to co-operate with aircraft will only be obtained if the car personnel fully appreciate the capabilities, needs and limitations of aircraft. While some measure of success in this direction may be achieved by the attachment of liaison officers to Army units, such a policy has obvious drawbacks and cannot be depended upon to the same extent as that now advocated, and which has worked with such success wherever it has been tried out in practice.

Only a trained pilot can be expected to locate suitable landing places for aircraft and to be always on the look-out for such places. The selection of sites upon which to erect message-picking-up apparatus, a knowledge of the radius of action of particular types of aircraft under varying conditions, the sort of weather in which aircraft can and cannot

operate, and what a pilot is likely to be able to see at various heights and in different conditions of visibility, are all matters which call for specialized training, and they are only a few of the matters with which the personnel comprising the ground force must be familiar.

It is assumed, therefore, that, except in countries like India, where all ground forces are provided by the Army, the armoured and armed car force will be provided by the Royal Air Force and manned by Royal Air Force personnel.

The training of car crews must be carried out in very close conjunction with aircraft in many branches of work, and for this reason it will be distinctly advantageous if both cars and aircraft are accommodated at the same place. In fact, there seems to be no adequate reason why this policy should not always be adopted. By this means both officers and airmen keep in very close personal touch with one another, training programmes are more easily arranged and carried out, and a very desirable spirit of co-operation can be fostered. No opportunity is then lost of carrying out exercises together whenever suitable opportunities occur. Moreover, should local disturbances occur, the cars provide a very valuable addition to the aerodrome guard, defences which are provided for aircraft when at rest being equally suitable for the ground force under similar conditions.

The subject in which car crews require to be trained, and the scope of that training, may be conveniently classified under the following headings:—

(*a*) *Driving.*

It is obviously unnecessary to stress the need for a high standard in this subject. Driving under all possible conditions should be frequently practised, particularly in soft sand and under conditions such as will exist after rain.

While the driving of members of the crew who are to be actually employed on those duties will be of primary importance, all personnel employed should be capable of driving in an emergency.

(*b*) *Maintenance.*

The maintenance of both the types of vehicles recommended when working in undeveloped countries, where roads either do not exist or consist merely of rough tracks, will be a matter of great importance and will require constant attention. Particularly is this so with the six-wheeler when employed under the arduous conditions caused by the presence of soft sand. After an ordinary operation or exercise under these conditions extending over several days, it will usually be found necessary to effect a number of replacements of defective parts.

A well-equipped workshop and an adequate supply of spare parts

are therefore necessary at the base, and suitable provision must be made for fitters in workshops, and to undertake maintenance when on the move. The latter duty will, of course, be undertaken by drivers, who therefore should almost entirely be of the fitter-driver class.

(c) *Armament.*

The members of crews who are normally employed as gunners must possess an intimate knowledge of their weapon and of its maintenance, in addition to being trained in its actual use on the range and on the car.

In the type of country which is being considered little difficulty will usually be experienced in providing targets at which firing may take place while on the move.

It is again necessary that all other members of crews shall be trained in the use of their armament and be able to replace or reinforce gunners in an emergency. They will also have to be trained in the use of the type of bomb provided and either the rifle or pistol, as the case may be.

(d) *Signalling.*

A knowledge of signalling, both by means of flag and lamp, will be an essential part of the training of car crews, both as a means of communication between cars on the ground, and possibly also as an alternative means of signalling by lamp to aircraft in the air.

(e) *Message Picking-up.*

Sufficient training in this subject, combined with practical experience, is necessary to ensure that the apparatus provided is efficient and that personnel can use it.

(f) *Map Reading.*

All members of crews must be capable of reading a map, and should possess an intimate knowledge of their territory. No opportunity should be overlooked of increasing knowledge of the country in which they may be required to operate.

(g) *Wireless Telegraphy.*

As stated previously, every car force should be provided with wireless telegraphy suitable for communication both with its base and with aircraft in the air. The possibility of using direction finders should receive consideration.

A wireless telegraphy operator, and if necessary a reserve operator, must therefore be provided, and frequent practice in this important method of communication should be obtained by means of exercises.

(*h*) *Aircraft Co-operation.*

It is fairly certain that most officers, a considerable proportion of N.C.Os. and some of the airmen employed with cars will have had experience with a flying unit. The amount of actual instruction, therefore, which is necessary under this heading is a little difficult to lay down definitely, and must depend upon circumstances. A great deal of additional experience will be gained, however, by means of suitably arranged exercises, when the various methods of communication can be tried out and crews can be taught how to mark out an emergency landing ground and the method of indicating wind direction to aircraft about to land.

(*i*) *Languages.*

While a knowledge of the language spoken in the country is most valuable and should therefore be encouraged, it can be taken for granted that whenever operations are taking place an interpreter, a political officer or an intelligence officer will always be available.

(*j*) *First Aid.*

Each vehicle will be provided with a first-aid outfit, and all ranks should understand how to use this outfit.

Good results in training will be obtained only with the very closest co-operation between cars and aircraft.

To take a typical example of one of the sort of problems which may occur, great difficulty will often be experienced in unmapped and featureless country, in directing cars to an objective which has been located by aircraft. The solution of this problem will require close co-operation and the development of some simple system. It can be done in various ways, but whatever system is adopted must be frequently tried out in practice.

A system which has been found to work from experience in Transjordania is for the aircraft to inform their base by wireless telegraphy of the approximate bearing of the objective from the base. On receipt of that signal the cars are dispatched and are then met by aircraft, who have returned for the purpose. The further movements of the cars can then be directed either by wireless telegraphy, by message-dropping, or simply by the cars steering the same course as that flown by aircraft.

Similarly, pilots need to be practised in locating and following the tracks made by cars. With a little experience it is surprising how easily this can be done.

The need to bring cars to the scene of action with the maximum rapidity may be even more important in the future than in the past. Natives are already beginning to appreciate that the effects of air action

are very much reduced in the open if they disperse when attacked. In order to reap the full results from air action in future, it may be necessary to arrange for simultaneous attack by aircraft and by cars.

9. Tactical Employment.

While a form of drill can very easily be designed with the object of using armoured cars in some sort of formation, apart from the moral advantages conferred by smartness in performing a drill, any such drill must possess limited value for operations.

The method of employing cars will always depend upon the nature of the country and surroundings, and the type of formation which might be suitable under any given set of conditions would probably be most unsuitable under other conditions.

It is an accepted principle that armoured cars never work singly, but that two should be the minimum number to be employed. The object of this stipulation is, of course, to ensure that assistance is always available in the event of one car breaking down.

A simple form of drill is necessary, however, for traffic control purposes, to ensure that armoured cars can move about in close formation, and can bring their guns to bear in any given direction with the minimum delay and without obstructing one another's fire. Consideration must also be given to the use of ground guns when it is necessary to employ them. These guns can, of course, only be used when cars are stationary, and here again the question of siting the guns depends upon field of fire and the necessity for not obstructing that of any other gun.

Very much of the same remarks apply to the employment of the armed but unarmoured vehicle as they do to the armoured car.

They should never be employed in smaller numbers than pairs, and it is again not possible to lay down any rigid form of drill which will be equally suitable under all conditions. Each tactical situation must be dealt with differently as it occurs, according chiefly to the nature of the country.

It can be safely assumed that when working in the close vicinity of an enemy, cars will always be in close touch with aircraft, so that there should be little risk of their being surprised.

10. Organization.

The present organization of the Royal Air Force armoured cars into sections and companies appears to be very satisfactory and could hardly be improved upon.

In places where the country is entirely suitable for the employment of armoured cars it is very desirable that they should be provided, and no other type of fighting vehicle is necessary, though even then some

other form of tender or carrier is necessary for the conveyance of personnel or stores.

When conditions are not entirely suitable for armoured cars the six-wheeler or similar type will have to be provided. These vehicles can be organized on more or less the same basis as armoured cars.

In places like Aden, where the number of vehicles required is limited and where both types may be required, there is no reason why the car section should not consist of a proportion of both types.

On the other hand, when it is not thought necessary to provide the six-wheelers permanently as fighting vehicles, the vehicles with which units are now normally equipped abroad for transport purposes can be quickly converted to meet requirements, provided the necessary gun mountings and trained crews are available.

11. Conclusion.

Having examined the various factors which govern the employment of armoured or armed but unarmoured vehicles in undeveloped countries, it only remains to recapitulate the outstanding conclusions which have been arrived at.

There can be no doubt but that for the realization of the full possibilities of aircraft a force of cars must be provided, as they are essential complement to aircraft and are required for a variety of purposes, not always or even often of a warlike description. The nature of the countries which are being considered, and more particularly the lack or complete absence of roads, has a most important bearing upon the problem of the sort of vehicle which will prove suitable. Any single type of car cannot prove equally suitable under all conditions, and two types will almost always be required. The armoured car and the six-wheeler now normally used abroad have proved eminently satisfactory, and apart from minor modifications should be able to meet all needs.

As far as the question of training is concerned, the closest possible co-operation between the ground and air forces must be obtained in order to achieve good results. All personnel must have a very thorough knowledge of one another's difficulties and limitations, and this can only be obtained in the first instance by ensuring that car personnel have had air experience, and secondly by the arrangement of suitable combined training programmes and exercises.

Finally, the success of combined operations, or work between cars and aircraft, depends very largely upon efficient communications. The ability to communicate by all the available alternative means according to requirements is most important, and too great stress cannot be laid upon the desirability of communication being maintained even while cars are on the move. This, of course, necessitates thoroughness in combined training.

THE EMPLOYMENT OF FLYING BOATS IN CO-OPERATION WITH NAVAL VESSELS

By Wing-Commander D. G. Donald, D.F.C., A.F.C., *p.s.a.*, R.A.F.

Although air power attains its fullest scope when it is employed on direct offensive action as a primary arm, the aim of this paper is to examine the many occasions when it is necessary to employ flying boats in co-operation with naval vessels.

Before considering the methods of employment, however, it will be as well to set out the special qualifications of the flying boat, and to show that it is well suited to the tasks it may be called upon to perform.

(*a*) *Endurance*.—The endurance of a " Southampton " varies from six to eight and a half hours, according to the weight of bombs and crew carried, at a cruising speed of 70 knots. The " Iris " has about nine and a half hours' petrol at an economical cruising speed of 75 to 78 knots.

(*b*) *Carrying Capacity*.—To take the " Southampton " again as an example, the bomb load is 1,100 lb. With a reduced petrol load it is possible to carry two 1,425-lb. torpedoes without exceeding the load recommended for service conditions.

(*c*) *Accurate Navigation and Reliable Communications over Long Distances*.—The navigator and operator can work under comfortable conditions with adequate room for equipment.

(*d*) *Mobility*.—The flying boat is able to operate from temporary bases, can be self-contained in the matter of crew, stores, accommodation, etc., for short periods, and can refuel in sheltered water without elaborate arrangements.

It is, however, necessary to utter a warning. The flying boat is to-day the most mobile type of aircraft, and because it can, if necessary, fly over land and sea, and operate from temporary easily improvised bases, it can be used on many duties. It is therefore important to see that its use is restricted to those forms of activity to which it is specially suited, and that it is in particular not employed on duties essentially those of aircraft of the Fleet Air Arm, provided, of course, that such aircraft are available.

The Rôle.

The rôle of the flying boat in naval co-operation may for convenience be placed under five headings:—

(*a*) Continuous patrol of areas.
(*b*) Convoy escort.
(*c*) Long-distance reconnaissance.
(*d*) Attack of submarines and lightly armed surface craft.
(*e*) Long-distance attack of oversea objectives.

Some of the above duties can be carried out by flying boats independently, but, as the aim of such duties is subsidiary to the aim of the naval arm, they are classed as co-operation.

Let us now consider each in detail.

Continuous Patrol of Areas. The sea areas that require to be patrolled in war are various. They may be the coastal waters of our Empire, great trade-ways, or narrow seas, but in all probability the focal and terminal areas of the trade-ways will require most attention. The focal areas are formed by the convergence of the trade-ways owing to the configuration of the land: the areas off harbours or the mouths of big navigable rivers are the terminal areas. These, particularly the latter, are the areas in which shipping will be thickest and therefore invite enemy attack.

Attack may come from submarine, surface craft, or aircraft, but whichever form it may take the flying boat increases the visibility of the surface craft on patrol, and if unable itself to destroy the enemy is able to summon assistance.

At the risk of stating a commonplace, it is as well to remember that sea power is applied through the medium of economic pressure; to attack enemy trade and defend our own is therefore of paramount importance. In this duty aircraft can afford definite assistance to surface craft, and it may justly be said that patrol over the sea, either continuous patrol of an area or convoy escort, is the principal rôle of the flying boat in co-operation.

On patrol in home waters, flying boats normally fly between 1,000 and 1,500 feet. The height affords the best compromise between range of vision and ability to detect objects on the surface or submerged. From a greater height it is unlikely that submarines will be sighted. Even under the best conditions of visibility—sky, sea, and sea bottom—the pilot of a flying boat considers himself fortunate to observe a submarine at periscope depth at a greater distance than three or four hundred yards, and the slightest trace of " white horses " renders the detection extremely difficult. If the submarine is on the surface, or half-submerged with conning tower awash, the task is simpler and it may be possible to sight her at a distance of three or four miles. If the submarine is entirely submerged she may be said to be invisible, unless the aircraft flies vertically over her before she dives deep.

These remarks apply to the detection of submarines in the Channel, North Sea, Irish Sea and Baltic. Better conditions obtain in the Mediterranean and elsewhere, but there is so much uninformed talk on the subject that it is as well to emphasize the difficulty of submarine detection from the air.

As a consequence, it would seem that aircraft are not of much value for anti-submarine patrol, but if the aircraft can sight, attack, or report a submarine, its action is of definite value; and even if no attack can be made, the effect of the aircraft on the submarine must be considered. If a submarine can be forced to submerge, her endurance is greatly reduced, the difficulties of navigation are increased, and the chances of carrying out attacks on shipping lessened. Further, the necessity of remaining submerged during daylight hours increases the strain on the personnel of the submarine, and the moral effect may be considerable.

Aircraft have therefore a definite place in an anti-submarine patrol.

Detection of surface craft is much simpler, and the task of the aircraft

is to identify the enemy and report his position, course, and speed, shadowing him and attacking if lightly armed.

Flying boats on continuous patrol of an area will operate with and under the orders of the local senior naval officer, with closest possible liaison. Constant co-operation should therefore be practised in peace-time, and crews of flying boats should acquire an intimate knowledge of submarines and take every opportunity to study the methods of submarine commanders, as well as the means of detection and counter-measures employed by the anti-submarine flotillas.

Before passing on to the next rôle of the flying boat, it should be noted that it is impossible to lay down any hard and fast methods of patrol for aircraft. The methods of searching an area depend on its extent, the number of aircraft available, the speed of the enemy, and other factors. The form of the patrol must be designed to suit the occasion and locality.

Convoy Escort. Owing to her great losses in shipping from submarine attack during the war, 1914-18, Great Britain adopted in April, 1917, the expedient of confining shipping to convoys, and continued this practice until the Armistice. There are obvious disadvantages to the system of convoy, one being the slowing up in the speed of shipping and the consequent reduction in the number of trips made, but the greater security afforded more than compensated for the inherent disadvantages of the system, and it is reasonable to suppose that in any future war against an enemy possessing sea or air power, resort will be had to convoy. In the last few months of the war 1914-18, 92 per cent. of Allied shipping sailed under convoy.

The opposition to be expected may be from submarine, surface craft, or aircraft. Convoys will be escorted by light surface craft, and covered by stronger forces: it may also be necessary to provide them with the protection of fighters, but the primary duty of the flying boat will be anti-submarine and will be achieved by continuous patrol of the areas ahead, on the flanks, and astern of the convoy. Early information as to the presence of surface craft or mines will also be of great value.

The form of the patrol will depend on various factors, such as the speed of the convoy, the maximum speeds on the surface and submerged of the enemy submarines, the disposition of the anti-submarine screen, and visibility. Patrols are designed to cover those areas in which submarines may be an immediate danger to the convoy and to prevent submarines from shadowing.

Long-distance Reconnaissance. It is possible to visualize three forms of long-distance reconnaissance that may be required in war, each of which can be satisfactorily carried out by flying boats, provided bases are available.

Firstly, long-distance reconnaissance, probably 200 to 250 miles ahead of the fleet, beyond the capabilities of the aircraft of the Fleet Air Arm embarked in carriers, may be of great value.

Secondly, long-distance reconnaissances of an enemy fleet or base, perhaps across minefields, are certain to be required. Such reconnaissances would be supplemented by photographs, and it is conceivable that flying boats might alight and watch enemy movements should sea conditions permit.

Thirdly, long-distance patrols in defence of a base at dusk, early morning, and even during moonlight nights, would assist to prevent surprise attack of the base by hostile surface craft.

In all the above forms of reconnaissance, the flying boat, in the event of sighting the enemy fleet, would carry out the normal duty of fleet reconnaissance aircraft, namely, to report the position, composition, disposition, course and speed of the enemy to the Admiral.

Attack of Submarines and Lightly Armed Surface Craft. The weapons of the flying boat are the machine gun and bomb or torpedo. The bomb and torpedo are essentially weapons of offence, the machine gun being more defensive in character owing to the lack of manœuvrability of the flying boat.

On this account, and owing to the relatively poor performance of a flying boat and the large target it offers, it would seem that day-bombing objectives should be restricted to lightly armed craft and submarines, for the latter, although armed, cannot afford to accept the risk of determined bombing and are more likely to submerge than to fight.

The bombing of surface craft does not differ much from the bombing of fixed objectives, and is rendered more accurate by the introduction of the fourth vector in the bombsight to allow for course and speed of the target.

The comparative efficacy of attack by bomb and torpedo does not lie within the scope of this article, and will not therefore be discussed.

The bombing of submarines, however, deserves special consideration. It must be realized that the submarine usually hears or sees the aircraft in time to submerge before the attack can be delivered. The aircraft therefore flies to the position at which the submarine was sighted, diving to the minimum height from which it is safe to release the bombs, and levelling up in time to settle on a steady course and at a constant air speed before bombing. The tendency, of course, is to bomb the swirl of submersion, rather than the estimated position of the submarine.

During the war, 1914-18, only ten of the 361 submarines sighted were known to be sunk by aircraft, less than 3 per cent. The deduction to be drawn from this is that aircraft are not the proper weapon of destruction: in fact, the lesson of the whole anti-submarine campaign proved that it is not by any one weapon alone that submarines are destroyed, but by carefully co-ordinated, unceasing and cumulative pressure exerted by the various forces—mines, aircraft, A./S. vessels, and decoy ships.

Long-distance Attack of Oversea Objectives. Within their radius of action from a main or advanced base, flying boats may be called upon to attack oversea objectives, such as a fleet in harbour, a dockyard, or a submarine base. Such attacks may have to be carried out with bomb or torpedo by night or by day, according to the strength of the defences and the possibility of achieving surprise.

Being able to navigate accurately over long distances, and having a large load capacity and good defensive powers, flying boats are able to carry out these tasks. The bombing of submarine bases is, in particular, a duty that is very likely to fall to their lot, since the destruction of submarine bases is obviously the best way of destroying submarines.

Development.

Such, then, are the various duties in co-operation with naval vessels that flying boats are likely to be called upon to carry out in war. The technical development that may be expected during the next few years would not appear to alter the nature of these duties. Higher speed and

ceiling, larger endurance and load capacity, will all render the tasks easier of achievement.

Improved seaworthiness—and by this is meant not only ability to ride out a gale at moorings or at anchor, but, what is more important, ability to take off and alight in a rough sea—improved methods of refuelling and loading with bombs and torpedoes while on the water will make the flying boat even more mobile.

The development of anchors, bombsights, night-flying devices, range-finders and smoke bombs, the substitution of stainless steel for metal parts that are liable to corrosion, and the introduction of heavier guns will all assist to improve the versatility of this type of aircraft.

Night Flying over the Sea.

The foregoing remarks refer in the main to day flying, and before concluding it is desired to refer briefly to the employment of aircraft over the sea at night, a subject that often gives rise to loose and frequently uninformed talk.

The operation of taking off and landing a flying boat in the dark presents no difficulty, provided the pilot is assured that the area of water is clear of shipping and other obstacles. As regards visibility over the sea at night, it is reasonable, on a full and a half-moonlight night with little cloud, to send aircraft to search a sea area to find a fleet or even individual ships, but on other nights the chances of success are small, unless the fleet is steaming at high speed in a calm sea or its position can be estimated with fair accuracy.

It is certainly most unlikely that an anti-submarine patrol, even on a night with full moon and no clouds, would be economical, though there may be a good chance of surprising submarines on the surface charging their batteries or endeavouring to make a landfall, either at dusk or at dawn.

Conclusion.

To sum up, the following points must be emphasized:—

Since the flying boat is the most mobile form of aircraft, capable of many and diverse duties, it is essential to guard against its misuse.

Its chief rôle in war in co-operation with naval vessels will probably be to attack and defend trade, to assist in the " control " as opposed to the " battle " formations of a navy.

Other forms of employment will be strategical reconnaissance ahead of the fleet, and long-distance reconnaissance of and attack on enemy fleet and bases.

It would appear, however, that continuous patrols of large sea areas will form the larger part of its activities in a war against a naval power, a duty for which it is particularly suitable.

The reader will perhaps have noticed that no reference has been made to the employment of flying boats on " visit and search " or in the direct attack on merchant shipping. How far a belligerent may interfere with commerce is still undecided and would appear likely to remain so.

At anchor in the Palaw River, Lower Burma.

The enchanted Marble Islands, the home of the Sea Swallow.

CALCUTTA-SINGAPORE AIR ROUTE

BRIEF NARRATIVE OF A SURVEY CRUISE BY TWO FLYING BOATS OF No. 205 SQUADRON.

PERIOD OF CRUISE: NOVEMBER 26TH TO DECEMBER 31ST, 1929.
AIRCRAFT: TWO SUPERMARINE FLYING BOATS (S.1127 AND S.1150), EACH FITTED WITH TWO NAPIER LION ENGINES.

BOTH flying boats left Singapore early on the morning of November 26th and flew in two stages to Victoria Point. The two following days were spent inspecting possible sites for permanent moorings and for landing grounds.

All misgivings on the part of the crews as to food supply were set at rest on the first day out from their base by a gift of eggs and fresh fish from a gentleman of the name of Joo Seng, a naturalized British subject living at Victoria Point. Many such gifts were to follow at most of the places visited.

On the 29th both aircraft took off and proceeded independently.

THE S.1127.

This boat proceeded to Tavoy and *en route* sighted H.M.I.S. *Investigator* in Hastings Harbour, St. Matthew Island, a landing being made alongside her. After a stay of only five minutes, the flight was continued to Port Owen, Tavoy Island, where anchor was dropped about 100 yards from the shore. During a stay of about two and a quarter hours, all hands took the opportunity of bathing in the beautifully clear water close in shore. That afternoon the flight proceeded to Tavoy, where the night was spent.

The following day (30th), landings were made at three places *en route* to Heanzay Basin. At one of these, Luce Hill, a party of one officer and one airman rowed ashore to inspect a prospective site for a landing ground. Although the wind was only a gentle breeze at the time, there was quite a considerable swell on the water, causing a surf on the beach. This made the landing and launching of the rubber dinghy a wet and undignified procedure for the occupants, but caused considerable amusement to the crowd of natives who had collected along the shore.

After weighing anchor and taking off again, a course was steered to the North Moskos Islands. An indication of the clarity of the water in these regions may be gauged from the fact that, when flying over these islands, shoals of fish could be seen from the air swimming in the water surrounding these islands. A landing having been made in the Heanzay Basin, two officers proceeded ashore and shot a number of pigeon, which provided the crew with a welcome change to the usual tinned provisions. Even more palatable dishes were to be added, for natives living in huts about a mile from the anchorage were to prove not only friendly but welcome hosts. They brought gifts of fruit and turtles' eggs, and also acted as guides ashore. The natives showed no

fear and little surprise at the flying boat, but, like all the natives along the coast, took great interest in the rubber dinghy, which seemed to intrigue and amuse them enormously. At some of the places visited later in the cruise, natives collected in dozens and squatted round the dinghy for hours until the crew had returned, when the operation of launching would arouse much merriment and enthusiasm.

On December 1st a short flight was made over the Heanzay Basin and a visit paid to the North Tavoy Tin Company's camp, which was situated in this district. A landing was made along the eastern bank of the Basin close to the mining village of Pyingi. The staff of the camp consisted mostly of Americans and Australians, with whom the officers of the flying boat breakfasted in the camp mess. To quote from the report: "There are about a dozen white men working at Pyingi and they appear to lead an isolated and not very comfortable existence, surrounded, as they are, by mangrove swamps. The nearest town, Tavoy, is sixty miles distant, and the means of transport difficult. The tin dredge, one of the biggest in the world, has excellent workshops and equipment capable of dealing with aircraft repairs in emergency."

The report of the following day's activities will be given *verbatim*, for it is typical of a day's work on this cruise, with the exception perhaps of the repairs referred to, which were among the few very minor technical troubles experienced with either flying boat throughout this cruise.

"In the early morning the flying boat's officers, taking a native as guide, climbed round the rocks forming the Dolphin's Nose to investigate the possibilities of the landing-ground site between this point and the points farther west.

"This ground was found to be unsuitable and the officers returned on board the flying boats at 1115.

"During the afternoon a water leak was found to have developed on the double induction pipe at the branch pipe welding beneath the vent cock. This defect was repaired temporarily with adhesive tape and the radiator topped up with water brought off from the shore by the natives.

"At 1550 anchor was weighed, and the aircraft took off for Pig Island at 1608. After landing and anchoring off Pig Island the conditions were found to be less favourable than had been expected—the shore being steep, rocky and exposed to the N.E.

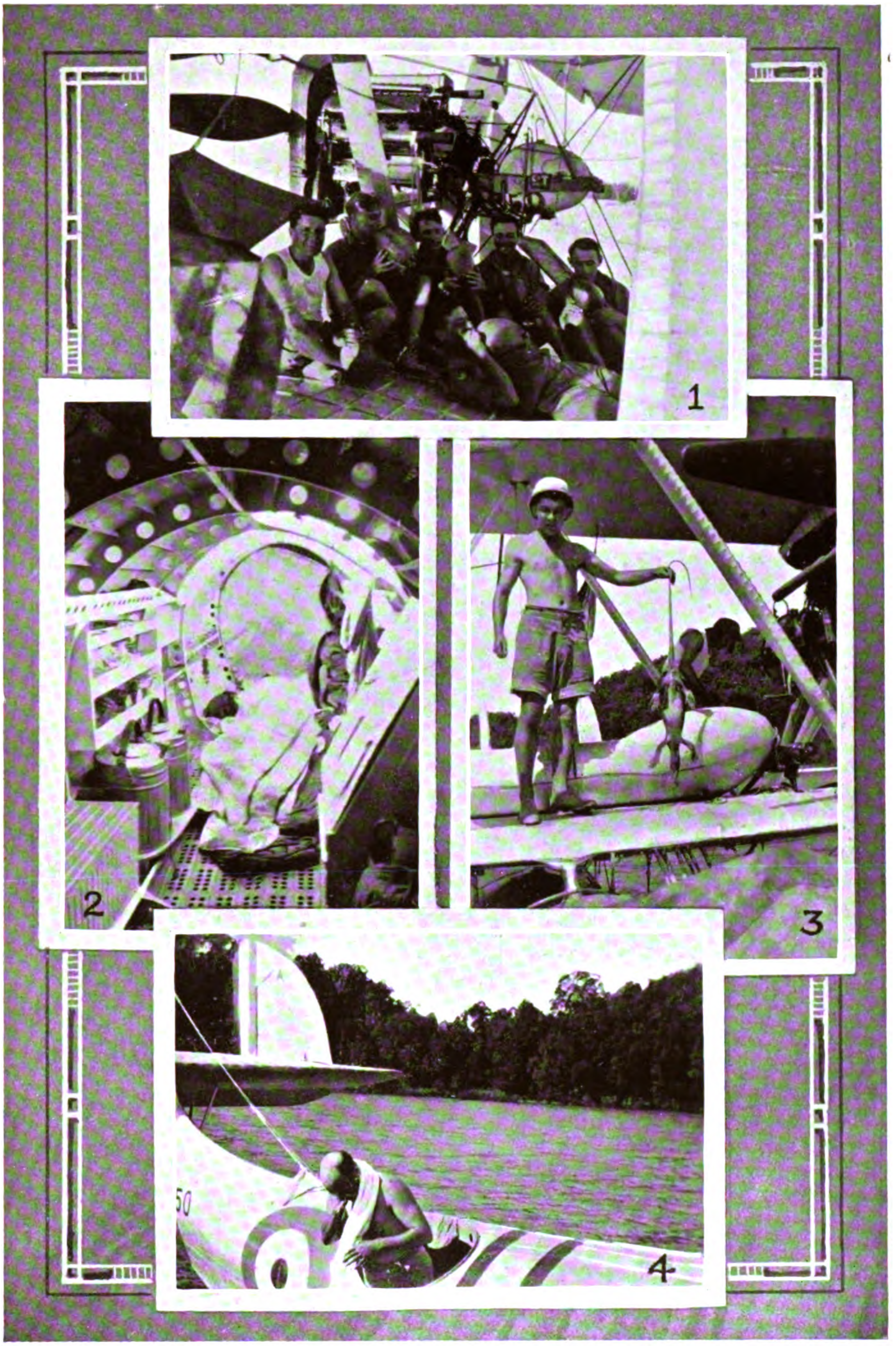
"The anchor was therefore weighed and the aircraft took the air to search for a more suitable site where a stop could be made for the night.

"A good sheltered anchorage was eventually found on the east side of Stag Island, and a landing was made there at 1700. After a good deal of manœuvring on the water, during which the aircraft once ran aground on the mud, a suitable anchorage was found by sending the rubber dinghy ahead to take soundings and pilot the flying boat into the required depth. The anchor was eventually dropped in three fathoms 100 yards from the low water level. The sandbags were immediately taken ashore and filled with stones to load the anchor line, after which all was secured for the night by 1800.

"The flood tide ran very strongly during the night and some anxiety was felt in the event of the wind rising and assisting the tide to drag the anchor. The night, however, remained calm.

"All hands slept on board the flying boat."

At 0430 on December 3rd the crew were awakened by the arrival of a fleet of fishing boats from the mainland, the crews of which, with



1. Meeting of the two crews in Gwa, Burma, on Christmas morning. Liquid refreshment was obtained from coconuts.
2. The Engineer's bed in the tail of the flying boat.
3. An iguana shot on Sampi Island.
4. Early morning toilet.

1. H.M.I.S. "Investigator" at anchor in Hastings Harbour.
2. Enjoying a bathe on Christmas morning, Gwa, Burma.
3. Karen children being given a "joy ride" in the collapsible boat at Mali, Tavoy Island.
4. A frequent occurrence owing to overcrowding.

their incessant chattering and excited yelling, made further sleep impossible. These natives crowded round the flying boat as close as possible and were a source of great annoyance, for, although quite obedient when told to go farther away, their natural curiosity forced them to creep closer and closer when no one on board appeared to be looking out.

The water between Stag Island and Ye River appears to be a good fishing ground, for, on the return flight, the area which had been used for landing and taking-off was seen from the air to be covered with fish traps and fishing boats.

The following day, before starting off for Ku La Gauk Island, three members of the crew rowed ashore to try to shoot a large bird which had been seen the previous night and taken to be a wild turkey. At 0730 the party returned bearing a hornbill which had been shot in mistake for the turkey. The hornbill, which measured fully 5 feet across the wings, is a bird of beautiful colouring, but two hours' cooking failed to render it edible.

At Amherst, which was visited on December 6th, the crew met the first Europeans since leaving Singapore; they were Mr. Emerey, a Moulmein River pilot, and his family, who were the only European residents of Amherst.

The night of December 7th, the eleventh of the cruise, was the first spent ashore by any member of the crew, when one officer and two airmen were accommodated in the circuit house at Moulmein, where the flying boat remained for the next two days.

During December 10th to 15th, the flight visited Rangoon, Akyab and Maungdaw, at all of which busy days were spent ashore inspecting prospective landing grounds. It was during this period that the flying boat made its second-longest flight of the cruise, Rangoon-Akyab, a distance of 445 miles. It was during this flight also that Diamond Island, where there is a W./T. station, with which the flying boat was in constant touch throughout the cruise, was flown over and newspapers dropped for the W./T. personnel.

It was on the morning of December 17th, when at Cox's Bazaar, that the first difficulties with moorings were encountered. While both officers were ashore inspecting the beach, " the wind commenced to increase rapidly until it was blowing fully 30 m.p.h. The officers hastened back to the jetty, chartered a sampan and proceeded back to the flying boat as fast as possible. Owing to the strong wind and flood tide, the sampan took two hours to reach the mouth of the creek, by which time the two natives were too exhausted to row the remaining 300 yards to the flying boat against the wind and sea. However, by streaming the rubber dinghy astern of the flying boat at the end of all the available rope, the sampan was able eventually to transfer its crew nearly three hours after leaving the jetty.

" On arrival on board it was learned that at 1205 the flying boat had commenced to drag ashore. When in one fathom of water and obviously about to go aground on the beach, L.A.C. Williams and L.A.C. Baker started up the engines, taxied out clear and dropped anchor again in 8½ fathoms. The wind then commenced to drop and the anchor held safely.

" It is considered that both these airmen showed initiative and skill in carrying out this operation."

A flight lasting about an hour was made on December 18th over the

Matabari Channel and Kutubdia Islands, and a landing made in the open sea off the Kutubdia Lighthouse. . . . "The Light-house keeper, a Eurasian, showed the party over the light-house, after which they returned on board the flying boat. Kutubdia Island is very thickly populated, chiefly by Arakanese padi growers, and in the short time the dinghy was ashore a crowd of fully 1,000 natives had collected on the beach, whilst hundreds more could be seen running across the padi fields towards the light-house."

After a brief stay, the aircraft returned and anchored again in the Matabar Channel. . . . "During the forenoon the patience of the crew became exhausted by the persistent efforts of the local boatmen to hang on to the wing tips and tail plane, so a gun was suddenly produced and a shot fired into the air. The effect was most surprising, not only did the boatmen jump out of their boats into the river to swim shoreward with yells of terror, but the crowd of some 200 natives standing on the river banks also melted away and dispersed in panic."

The two following days were spent at Chittagong, and on the 21st the flight proceeded to Barisal. . . . "After making the island of Lukhidia Char, a course was steered direct from the Donmanik Islands according to the Admiralty Chart No. 859. This track should pass about 7 miles south of Hatia Island. Actually the aircraft passed over the south end of this island 18 minutes after leaving Lukhidia Char, and reference to the Survey of India Map No. 79 which was carried on board showed that this was correct. Admiralty Chart No. 859 therefore appears to be inaccurate and Hatia Island extends much further south than shown. Confirmation of this was received from the Collector at Barisal, in whose district Hatia Island is situated, who stated that, owing to the rapid building up of the south end of the island, many questions of land acquisition, etc., had arisen in recent years. Moreover, it was found extremely hard to recognize either the coastline or the islands from the Admiralty Charts, and the Survey of India Maps appeared to be much more accurate."

After rounding Landfall Point at 1015, a course was steered up the wide Haringhata River to Morrelganj.

At 1215 Patuakhali, on the Nohalea River, was reached after a few circuits and a landing made opposite the jetty, where two or three ferries were lying.

The folly of landing so close to a town was at once apparent, for in five minutes the aircraft was surrounded by every class of boat that could be persuaded to float, while nothing that the crew could do would persuade them to keep clear. The three-quarters of an hour at Patuakhali was spent entirely in preventing the crush of boats damaging the aircraft. This was accomplished by extraordinarily good luck, and no damage was done.

At 1303 the engines were started and enough room made for take-off by the simple process of taxi-ing straight at boats who were reluctant to move. By this means a narrow lane was cleared and a somewhat alarming take-off accomplished just when the aircraft left the water. Five minutes later another landing was made in the main river, Nohalea, about eight miles from Patuakhali, and the anchor dropped in five fathoms, fifty yards from the west bank, which allowed the crew to have a meal in peace.

Christmas morning found the flight at Andrew Bay, and shortly after

1. A glimpse of the Pakchan River, dividing Burma from Siam. Taken from the hillside above the mooring site at Victoria Point.
2. Victoria Point, the Southernmost extremity of British India.
3. **Mr. Joo Seng (centre), of Victoria Point.**
4. **Transport, ancient and modern.**

1. A group of murderers, dacoits and robbers paraded for inspection in the jail at Mergui.
2. A typical crowd of interested natives, all trying to get aboard at once.
3. The beach at Kyaukpyu, Burma.
4. Sliced fish, suspended by the tail, drying in the sun.

leaving for Gwa the S.1127 sighted the S.1150, which was flying from Akyab to the same destination, and both aircraft proceeded in company to Gwa, which was reached just before 1000. During the afternoon a party from both aircraft rowed ashore in an endeavour to shoot some suitable birds for Christmas dinner. Their (the party's) luck was out, so the crew were thrown back on tinned food.

THE S.1150.

It is at this point that we must return once again to November 29th, on which date the two flying boats parted company at Victoria Point on the outward journey, and narrate the story of the S.1150, which seems from all accounts to have had a more fortunate outward trip in quite a number of respects, principally those of sport and entertainment, and in the number and variety of edible gifts.

After leaving Victoria Point, the S.1150 proceeded to St. Matthew's Island. This island is fifteen miles long, mountainous and covered with dense jungle. In the centre of the island is a prominent peak which rises to a height of 3,000 feet. On the eastern extremity is Fish Harbour, a well-sheltered inlet surrounded by hills. St. Matthew's or Luke Islands are uninhabited except for occasional Selongs—Sea Gypsies.

After a brief stay, the flight was continued to Hastings Harbour, where H.M. Survey Ship was anchored. A landing was made alongside her, and that afternoon her Captain and First-Lieutenant "were taken up as passengers and notes were taken of Fish and Hastings Harbours at low water. The former was found to have almost completely dried out. Several reefs and shallows were seen which were uncharted, and the Captain said that this flight would save him many days' work. During the afternoon, Flying-Officer Boyce surveyed and sounded a bay chosen as a suitable S.W. Monsoon anchorage."

That evening the crew, both officers and airmen, dined aboard H.M.S. *Investigator*, and also had breakfast aboard the following morning before continuing the flight to Sullivan's Island, *en route* for which calls were made at the mainland opposite Turrets Islands and Pulo Dua. In the vicinity of the former, game is plentiful—wild boar, tiger, and elephant.

Sullivan's Island is uninhabited except for some native tin miners and wandering Selongs. The island is entirely covered by dense jungle to the water's edge, with high hills along its entire length. Two tins of fruit were traded for a quantity of dried fish.

Both officers went ashore to search for a fresh-water spring reported by the local fishermen, but were unsuccessful owing chiefly to the density of the jungle. A 5-foot iguana was shot on the rocks and skinned.

A point of considerable interest concerning the operation of flying boats over this route during the monsoon occurs in the diary under this date, to the effect that the local native headman stated that the water in this area was never rough during the S.W. Monsoon. Indeed the number of sheltered bays and waters along the whole of the coast from Singapore to Burma are so numerous that a flying boat is never out of gliding distance of a suitable stretch of water for more than very short periods when flying at a height of 2,000 feet or over.

November 30th and the following days were busy ones for the crew, and, although the total flying time was only 3 hr. 40 min., no fewer than about a dozen places were visited and surveyed for anchorages and/or landing sites. In fact, the average working day throughout the cruise

must have been in the neighbourhood of fourteen hours. This, however, did not detract from the very great interest and novelty of the cruise, both aspects of which are clearly brought out in the following extracts from the diary of December 3rd, 4th and 7th:—

"Crew turned to at 0615 and at 0730 were shown round the village by the Township Officer. The houses are of palm leaves, built on piles, picturesquely situated on the bank of the river amongst coconut palms. The inhabitants, numbering about 600, consist of Burmese, Shans, Malays, Chinese and Selongs, the Selongs living in tiny primitive huts on the south side of the village. There is no trade, the only occupation being fishing. There are no roads, the only communication being by motor sampan from Mergui. The surrounding country is mostly mangrove, but a small hill rises immediately behind the village to a height of about 350 feet, on the top of which is the police station, a conspicuous landmark. The Dak Bungalow and Courthouse are at the foot of the hill.

"The Township Officer sent off a curried fowl for tiffin and at 1315 aircraft left for the Marble Islands, 30 miles to the N.N.W., examining Paye Island *en route*. A landing was made at 1343 hours in the Bay between the two southern islands.

"The Marble Islands consist of a northern and a southern group and are conspicuous in that they rise almost vertically from the sea to a height of over a thousand feet. The tops are covered with trees and scrub, the remainder being bare rock.

"In the centre of the bay there is a small sandy beach, the only accessible part of the Southern Group, and adjoining it a narrow, winding, subterranean passage with just sufficient room for the dinghy to get through at low tide. At the far end is a lake of some 250 yards in diameter with vertical cliffs on all sides. This lake had been seen from the air, but is not shown on any chart or map. Two other lakes were also seen from the air. Their existence was not previously known and they are inaccessible.

"The caves inside the lake visited are used as nesting places by sea swallows. The collecting of these edible birds' eggs is one of the industries of the archipelago. The surrounding rocks were thickly strewn with *bêche de mer*, and both the lake and the bay were teeming with fish.

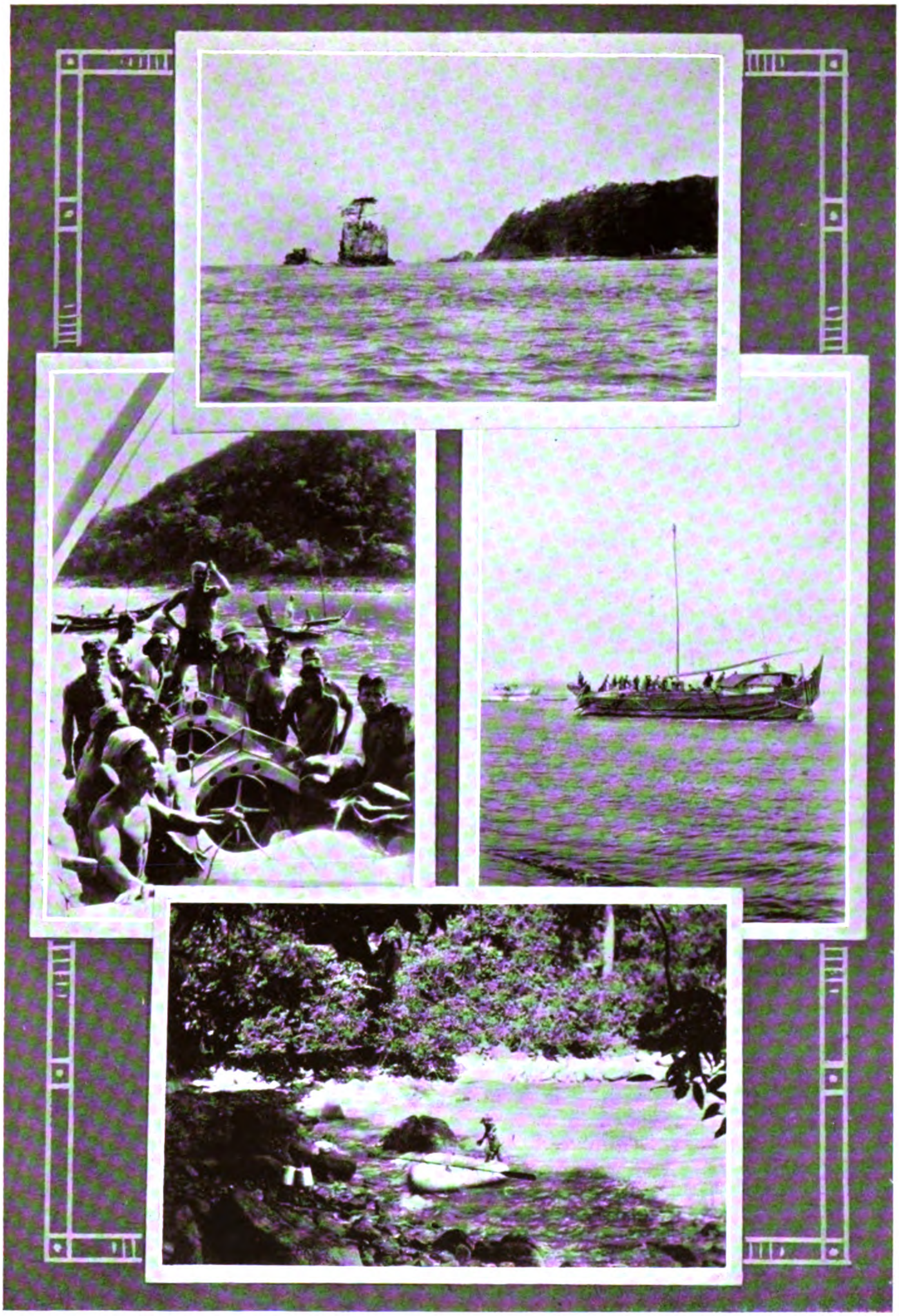
"Aircraft left at 1740 hours and flew up the East Coast of Domal Island. At 1755 aircraft landed in the dusk in a wide river on the West Coast of Kisseraing Island opposite Domal Island. Although the surrounding country is low-lying and covered with mangrove, this river is a very suitable anchorage in either monsoon.

"There were no mosquitoes and the night was clear and cool. The crew slept on board.

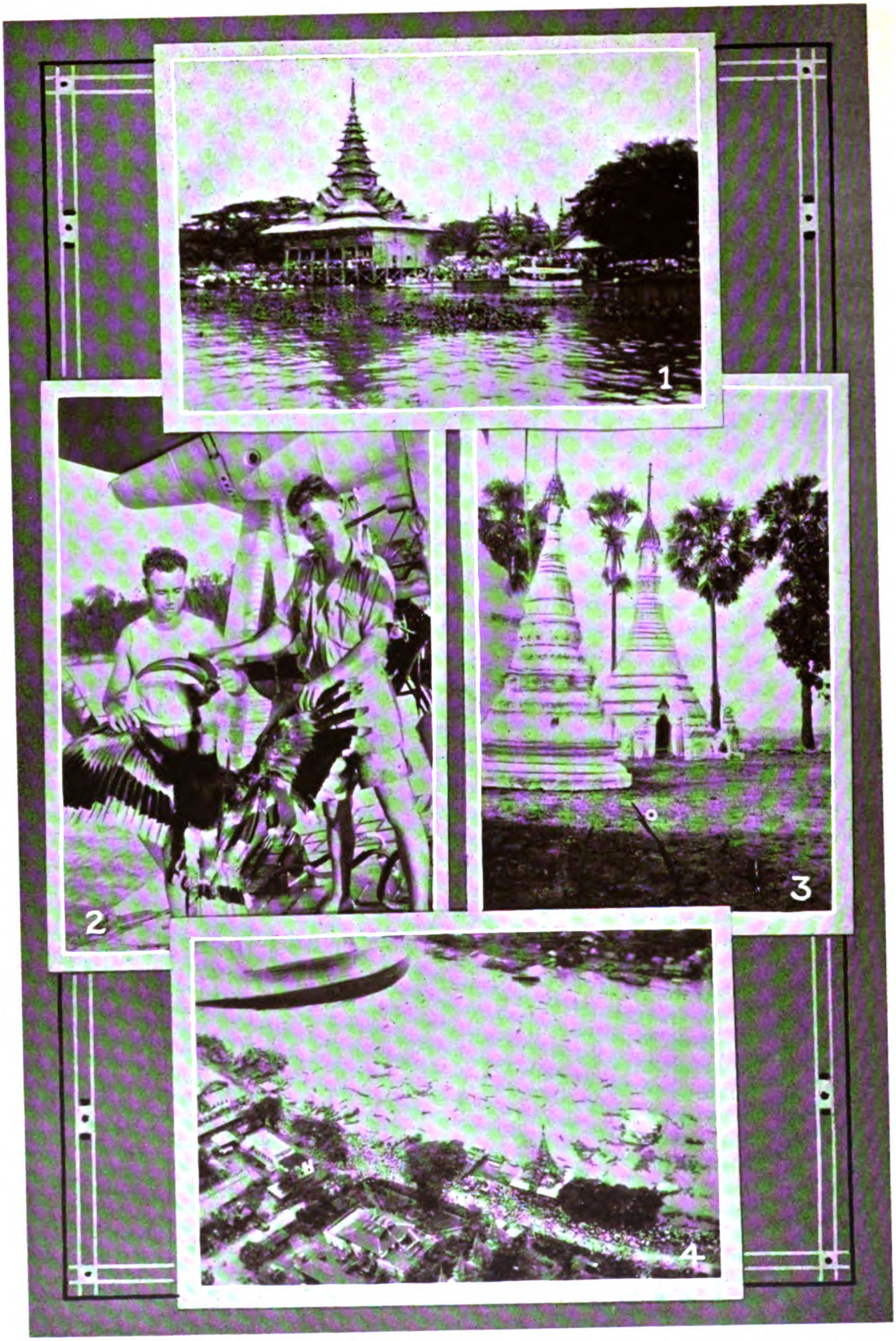
"*December 4th*. Crew turned to at 0530. A large number of native canoes had assembled all round the aircraft long before dawn, the news of our arrival having been passed from village to village the previous evening. This was done by the sounding of a gong in a small village on the river-side, followed by an announcement which could be distinctly heard being repeated up and down the coast.

"Although the west coast of Kisseraing is entirely mangrove swamp, the east coast is comparatively fertile.

"The area between Money Island and the northern entrance to the



1. A curious tree perched on a rock marking the S.W. entrance to Hastings Harbour, St. Matthew's Island, at the Southern extremity of the Mergui Archipelago.
2. Burmese fishermen of Edward Island listening to the Karen Minister from Savoy Island, who used the centre section of the flying boat as a pulpit from which to preach to the "heathen."
3. Like an Egyptian galley. A rice barge with its fifteen rowers.
4. Going ashore to search for fresh water.



1. Bassein, a large town in the Irrawaddy Delta, showing a part of the Pagoda Buildings and some of the floating water hyacinths which are causing serious interference to shipping in the Delta.
2. The Christmas Dinner which did not materialize.
3. Small Pagodas on a hilltop at the mouth of the Bassein River.
4. The River at Bassein as seen from the air. Interested crowds of natives may be seen on the river bank.

Passage was examined and a landing made in a bay sheltered from the S.W. The bay was examined and a mountain stream of fresh water found. Water drums were filled, clothes washed, and the crew had baths.

" Aircraft took off at 1030 and Julian, Kennedy, and Tucker Islands were examined. A suitable N.E. or S.W. anchorage was found on the north of Kennedy Island in a bay with a sandy beach. Aircraft landed at 1045 and anchored. The bay and beach were examined and a fresh water stream found. Camp was made on the beach and plans drawn and notes written up. Three Selong boats were drawn up on the beach when the flying boat landed, but within five minutes the natives had packed up and left. One boat returned later, having left someone in the jungle. The natives were practically naked. Their boat had a dugout base and the remainder was built up of bamboo, though how it was made water-tight could not be discovered. The Selongs live in their boats nearly all the year round and avoid all other natives. Their boats are exceptionally seaworthy and unsinkable.

" Several canoes appeared soon after noon, and the natives, apparently Shans, sat around our camp on the beach the whole afternoon.

" *December 7th.* Flying boat left Mergui at 1320 hours and course set for the northern end of Fell's Passage and King's Island Sound where two anchorages were examined. King's Island flanks the Western side of the direct route to Mergui and gives good shelter from the S.W. winds. Thence course was set for Palaw, on the mainland, a landing being made at Dorcas, to the South of Palaw, *en route.* At Dorcas, a broad almost land-locked bay was found with deep water and mud bottom. In the centre is a tree-covered island with a large fishing village round the shore. A fleet of some 50 canoes put off and so great was the excitement that it was not considered advisable to anchor, so, after taking soundings in various parts of the bay, the aircraft took off for Palaw, where a landing was made in the river near the town, and the boat anchored opposite the landing stage where the river is 75 yards wide. It was not until after landing that it was discovered that the telegraph wire running from Mergui to Tavoy passes over the river at a height of 40 feet.

" Within a few minutes the flying boat was surrounded by about thirty canoes all trying to get alongside, and all the occupants talking at the tops of their voices, clapping and cheering. It was with difficulty that they were kept from coming aboard, and, as more craft kept arriving, Flight-Lieutenant Carnegie went ashore and got two native police to come aboard and help keep the boats off, order eventually being restored. There are no Europeans in Palaw. The P.W.D. Officer came and offered his services and sent off a curried chicken for dinner.

" *December 8th.* Crew turned to at 0600 and, after getting the river clear of boats, soundings were taken, the flying boat taxi-ing two miles down the river. Taking-off was very difficult owing to the load of petrol, the number of sandbanks and stakes, and the bends of the river.

" Course was set for Port Owen, a wide sheltered bay on the East Coast of Tavoy Island, which flanks the western side of the route from Tavoy to Mergui. Four islands lie close to the mainland and to the northern side of Port Owen, giving shelter from N.E. or S.W. winds. A landing was made in a small bay on the N.E. corner of Edward Island and the bay examined. Half an hour later flying boat took off and

examined Owen Sound, landing in what appeared to be the most suitable anchorage, as the southern portion of the bay dries out.

"A canoe put off from the shore with three natives and came alongside. One of the natives came aboard and in excellent English said that this was a Karen Christian village belonging to the American Baptist Mission and that he was the schoolmaster and his brother the pastor. The latter, also speaking English, then arrived and invited us ashore. In a clearing beneath the palms was a wooden church and we were given chairs, the villagers squatting round in a wide semi-circle. The choir was then fallen in and sang a number of hymns to us in a very pleasing way. We then attended the church service, the preacher being a Karen home on furlough from the mission field in Siam where he had spent 10 years. The service ended by an appeal to all the children to bring a fresh egg each as a present to the flying boat, the pastor having interpreted to us throughout. As he had lived in the village all his life, his father having been the pastor there for fifty years, valuable information regarding local conditions was obtained, and it was ascertained that the bay was free from sharks, so the crew had their first sea bathing since leaving Singapore.

"In the afternoon the shore and village were examined and two fresh water springs noted.

"In the evening the choir came down to the beach and sang hymns and psalms for our benefit from 2000 until 2230, the pastor presenting us with several dozen eggs and some vegetables. The Karens, who originally came from the Chinese Border, are scattered over Burma in small groups and live by cultivating paddy on hill-sides during the wet season. They are of a shy nature and most have been Christianized by Karen Missionaries trained in Rangoon and Tavoy early in the last century, the first Missionary having been baptised in 1828. There are no other inhabitants in the island.

"*December 9th*. The flying boat left at 0827, carrying the pastor as a passenger in order that he might point out certain anchorages, landing in the channel between Edward and William Islands, where there is a very suitable bay, well sheltered in the heaviest monsoon.

"There is a Burmese fishing village in the channel and some forty Burmese, each carrying a fresh fish in his hand as a present, swam out to the flying boat. The anchorage was examined, soundings were taken and information obtained through the pastor, who acted as interpreter and who took the opportunity to preach to the villagers from the centre section of the flying boat.

"Rangoon was reached on December 10th and Bassein the day following. As no aircraft had previously visited Bassein, the river banks were crowded with spectators and the quay had to be cleared by police to enable the flying boat's crew to get ashore.

"On the 14th the flying boat landed in the river at Nga Yot where the crew were shown round the village of some 50 huts and 600 inhabitants and were taken to see a Burmese ex-Service man, late of the 70th Burma Rifles. He spoke some English and through him local information was obtained. He appeared to be in the last stages of malaria and begged for quinine. He was being treated by a native doctor, the treatment consisting of rubbing mud all over him. As there are no roads or other means of communication he could not get proper attention, and on returning aboard a supply of aspirin and quinine was sent

The only beach in the Marble Islands.

A casuarina-fringed beach on Matthews Island, Southern Archipelago.

off to him with instructions. The following morning he came alongside in a canoe looking a different man and said that he had had his first night's sleep for twenty days.

"On returning aboard, canoes again crowded round, and unless two members of the crew were kept on deck anything up to 40 natives would scramble aboard. The turning-over of an engine, however, led to immediate panic, everyone jumping into the water, and a large canoe containing many women and children was upset. All the occupants swam ashore and appeared to treat it as a joke."

It was during this part of the cruise along the Burma coast that gifts poured in from the local natives at most of the places visited. These gifts embraced fish, bananas, coconuts, boar's meat, a hornbill, sweetmeats, and Burmese cigars.

As previously mentioned, both flying boats met on the morning of Christmas Day and proceeded to Gwa, where all members of the crew bathed together in the afternoon and had Christmas dinner aboard in the evening.

The following day both flying boats flew in company to Rangoon, a call being made at Bassein *en route*. On arrival at the hotel at Rangoon it was found that Monsieur Le Brix, the French long-distance pilot, who had crashed near Moulmein some days before, was staying at the hotel. He was given every assistance possible, and even lent a suit of clothes from the scanty kit carried by the crews of the flying boats, as he possessed nothing but a pair of shorts and a shirt.

The 27th was observed as a holiday, and early the following morning Lieutenant Le Brix called upon the officers of the flying boats before they left for Tavoy and was shown over the aircraft.

Victoria Point was reached on the 30th and both aircraft arrived back at Singapore the following day, having been absent from their bases for a period of thirty-five days, during which they covered between them a distance of approximately 10,000 miles, the flying time being 122 hours; an average for each aircraft of 5,000 miles and 61 hours' flying. The number of places at which the aircraft landed was approximately eighty, at 75 per cent. of which they had ridden at their own anchors. The crews had slept on board for twenty-six nights out of the thirty-four.

It is noteworthy to record that in the case of the S.1150 the completion of this cruise brought her total flying time since purchase to 596 hours, and she had been afloat for one year and seventy-five days. During that time also she had experienced no trouble of any kind. With the exception of one or two minor technical troubles, such as the changing of one plug and a cracked manifold, the aircraft and engines behaved splendidly throughout the whole period of the cruise. Inter-communication by W./T. between the flying boats on the one hand and land stations and ships on the other, was constant throughout the cruise, the greatest range recorded being one of 550 miles.

As regards meteorological conditions, these generally were found to be excellent for the operation of flying boats. Visibility along the coast and to seawards was very good indeed, but in a number of places inland there was some low cloud and frequent haze, whilst the early-morning fog over rivers in Irrawaddy Delta was found in parts to persist until as late as 10 o'clock in the morning. There was a noticeable drop in the temperature, both during the day and night, north of Rangoon, and the crew found conditions in the air rather cold at times, as only tropical

uniform was worn. The sea was mostly calm or slight and never too rough for a flying boat to land safely in emergency.

The crews of both flying boats lived on board for practically the whole period of the cruise, only a few nights being spent ashore at the larger ports. In point of fact, sleeping on board was to be preferred, one reason for which was that mosquitoes and sandflies were less prevalent if not entirely absent. For exercise, apart from that entailed by the normal routine of looking after the boats, the personnel relied mainly upon bathing, a pleasant form of recreation at most times, but under the prevailing conditions and almost unique surroundings was made doubly so on this cruise. Bathing, however, was not entirely devoid of adventure, on account of local natives' stories of large crocodiles residing in the near vicinity.

Moorings were used only when they happened to be available, mostly at the few refuelling ports at which also no previous arrangements were made. For the greater part of the cruise, therefore, both flying boats rode at their own anchor, the standard anchor carried on each boat.

1. Interior of a Seloung boat from which the occupants had fled into the jungle on sighting the flying boat. The deck is of bamboo, the covering of plain thatch. Fresh water is kept in the Shanghai jar on the left, and the edible birds' nests, green snail and pearl oyster shell, which the Seloungs collect and exchange for rice, in the tin box on the right.
2. A Seloung boat being rebuilt at Mergui. The base is a dug-out log, the side being built up by threading pierced bamboos on to thin uprights, the tops of which are bent over and made fast inside. When put in the water, the bamboo swells sufficiently to render the boat water-tight. No nails are used in construction.
3. A typical Burmese fishing village. The huts are built entirely of bamboo and palm thatch. The platforms are used for drying fish, the staple food during the S.W. monsoon.
4. A group of "civilized" Seloungs living in a small settlement in Mergui.

THE LONDON NAVAL TREATY

By Our Naval Correspondent.

(Captain Taprell Dorling, D.S.O., R.N.)

To the greater number of journalists who attended it, the writer included, the London Naval Conference was as dull and as prosaic a business as can be imagined. It opened with a wealth of optimistic oratory by those about to take a leading part, and, for the time being, at any rate, public interest became largely focussed upon the Royal Palace of St. James. The Ritz, the Carlton, Claridges, and a house in Grosvenor Square were used respectively by the delegations from the United States, France, Italy, and Japan, and at times were besieged by crowds of Pressmen anxious for news. Powerful cars, displaying the various national flags, were seen in the West End and the neighbourhood of the Palace itself. We heard of the wonderful American typists and the American Marines, a small number of whom, not a battalion as was sometimes supposed, came over to act as orderlies and thereby followed a precedent set by Great Britain at the Washington Conference of 1922.

It was noticeable that Mr. Ramsay MacDonald and his British colleagues generally walked to the meetings at St. James's, and some of the more frugal-minded of us were secretly rather relieved to hear that the expenses of the foreign delegations were not being met out of British funds.

As week succeeded week and nothing happened, the public became indifferent—finally apathetic. Optimism gave way to dismal forebodings that all was not going well. Rumour followed rumour, and all the while the journalists, whose duty it was to provide news, and truthful news, for their newspapers, found it more and more difficult to obtain any news at all. There was nothing sensational to write about, nothing really exciting to attract public attention, and some went out of their way to invent scaremongering " stories " from tit-bits of information gleaned from here, there, and everywhere, and laboriously pieced together. They were generally wrong. We all of us in turn became busy with tons, and guns, and capital ships, and aircraft carriers, and cruisers, and special ships, and exempt vessels, and the humanizing of submarine warfare. But very little of what we wrote was really easily comprehensible to men or women in the street, the ordinary citizens who love their " human story "!

Day after day, as we attended the Press Conference at the Palace, we were told that the Prime Minister had not given up hope of obtaining a Five-Power agreement. Quite early in the proceedings, however, most of us had already made up our minds that if France and Italy maintained their demands—France for a very large " global," or total, tonnage, coupled with a heavy building programme of light cruisers, destroyers and submarines, failing further guarantees for her security by Britain and America; Italy, for parity with the strongest Continental Power, that is France—no Five-Power Treaty worthy of the name could be attained.

The aspirations of the Oceanic Powers (Britain, the United States, and Japan), on the one hand, and of the Continental Powers, on the other, were too widely divergent ever to be really reconciled. The only redeeming feature of the Conference from the journalistic point of view was the excellence of the Press arrangements at St. James's, for which we had to thank Sir Arthur Willert and Mr. G. F. Steward, both of the Foreign Office.

At last, on April 22nd, after a Conference with many ups and downs which had lasted for twelve weary weeks, a Treaty was actually signed. It was a lengthy document, consisting of five parts and twenty-six articles with two annexes. Eight articles—Articles 14 to 21 inclusive—comprised Part III, which was the Three-Power Pact signed by the British Empire, the United States, and Japan, but not by France and Italy. This portion of the Treaty is by far the most important. For the first time in history it gives Great Britain and the United States parity in vessels not dealt with in the Washington Treaty—that is, cruisers, destroyers, and submarines.

The Three-Power Pact.

Allocation of Tonnage. It is unnecessary to give the terms of the Three-Power Pact in any great detail. It defined cruisers and destroyers, and divided cruisers into two sub-categories—those carrying a gun heavier than a 6.1 inch, and those mounting a gun of 6.1 inches or less. The total tonnage of the cruisers in both sub-categories, of the destroyers, and the submarines that were to be in the navies of the British Empire, the United States, and Japan on December 31st, 1936, were also laid down in a table, which, with a little amplification, and with the Washington Treaty figures inserted, appears below:—

Categories.	*United States.* tons.	*British Empire.* tons.	*Japan.* tons.
Cruisers—			
(*a*) With guns of more than 6·1 in....	180,000 (18 ships)	146,800 (15 ships)	108,400 (12 ships)
(*b*) With guns of 6·1 inch calibre or less	143,500	192,200 (35 ships)	100,450
Total Cruiser tonnage	323,500	339,000	208,850
Destroyers	150,000	150,000	105,000
Submarines	52,700	52,700	52,700
Total tonnage of London Treaty ...	526,200	541,700	366,550
Washington Treaty—			
Capital Ship tonnage	525,000 (15 ships)	525,000 (15 ships)	315,000 (9 ships)
Aircraft Carrier tonnage	135,000	135,000	81,000
Grand Total	1,186,200	1,201,700	762,550

It will be noticed that the maximum number of large cruisers allowed to the British Empire was fifteen; to the United States, eighteen; to Japan, twelve; but that the numbers of destroyers and submarines remained unspecified in each case. The United States, moreover, accepted a slightly smaller cruiser tonnage than ourselves. This was to compensate for her slight preponderance in heavy cruisers, though, by another clause of the Three-Power Pact, she may, in the future,

substitute smaller cruisers for the last three of the eighteen heavy cruisers allotted to her, and thereby obtain parity with the British Empire both in cruiser tonnage and in the total number of vessels.

Aircraft in Cruisers and Capital Ships. Among other matters, the Three-Power Pact went on to lay down that not more than 25 per cent. of the total cruiser tonnage might be provided "with a landing-on platform or deck for aircraft." This, like paragraph 3, Article 3, of the Five-Power portion of the Treaty, which is worded as follows: "No capital ship in existence on the 1st of April, 1930, shall be fitted with a landing-on platform or deck," was inserted at the particular request of the Japanese. It was a reply to an American proposal eventually embodied in paragraph 2, Article 3, of the Five-Power Treaty, which runs: "The fitting of a landing-on or flying-off platform or deck on a capital ship, cruiser, or destroyer, provided such vessel was not designed or adapted exclusively as an aircraft carrier, shall not cause any vessel so fitted to be charged against or classified in the category of aircraft carriers."

What the Japanese had in mind, and expressly wished to prevent, was the possibility of a large proportion of the American capital ships and cruisers being provided with landing-on platforms or decks for the operation of slow landing, auto-gyro aeroplanes, which might thus provide a considerable naval air arm over and above the machines carried in the 135,000 tons of aircraft carriers allotted to the United States by the terms of the Washington Treaty of 1922.

The Three-Power Pact—British Cruisers. Other clauses of the Three-Power Pact allowed Britain to scrap the cruisers *Frobisher* and *Effingham* in 1936 before the expiry of their official "lives" of sixteen years, in order that these vessels, considered by the United States as the equivalent of 8-inch gun cruisers, should not swell the British total of heavier ships, and thereby cause a corresponding diminution in the number of smaller 6-inch gun vessels. It was also laid down that we might not complete more than 91,000 tons of new cruiser tonnage before December 31st, 1936; while Japan was permitted to replace one cruiser, and to lay down certain destroyer and submarine tonnage before the end of 1936 to keep her dockyards in operation.

The 91,000 tons of new cruisers allowed to be completed by us before December 31st, 1936, together with a total number of fifty cruisers, were the figures which entered into all the conversations between Mr. Hoover and Mr. MacDonald in America last autumn. The figure of 91,000 tons, which was further insisted upon by the British at the London Conference, is interesting as giving an indication of what our cruiser fleet will, or should, consist of by the end of 1936. It is shown below:—

15		8 inch gun cruisers,	totalling	146,800 tons.
14	new	6 inch gun cruisers	totalling	90,720 tons.
21	older	6 inch gun cruisers,	totalling	101,480 tons.
50	ships of a total tonnage of		...	339,000 tons.

The Safeguarding Clause. Article 21 of the Three-Power Pact is, without exception, the most important article of the whole Treaty. Without it, the Treaty would neither have been subscribed to by certain of the Dominion delegates, nor would it have been agreed to by the responsible naval advisers to the British Government.

Article 21 is the well-known "Safeguarding Clause" which gives

to the British Empire, the United States, and Japan the right to increase their tonnage in cruisers, destroyers, or submarines if their national security is " materially affected by new construction of any Power other than those who have joined " in the Three-Power Pact. If the all-important clause is to be evoked, the other parties must be informed of the increases and the reasons therefor, and are themselves entitled to make a proportionate increase in the category or categories specified.

Briefly, then, if France builds more than seven 10,000-ton cruisers, or carries into effect her proposal to build 78,000 tons of submarines, we also, to ensure our security, might exercise our rights under Article 21 and increase our cruiser and destroyer tonnages over and above the amounts of 339,000 and 150,000 tons agreed to in the Treaty.

The Five-Power Treaty.

The Capital Ship " Holiday." The first and most important article of the Five-Power Treaty provided for a capital ship " holiday," the Powers binding themselves not to lay down the vessels which, by the Washington Treaty, they were empowered to build between 1931 and 1936 inclusive. This undertaking applied to ten ships which might have been built by the British Empire, ten by America, three each by France and Italy, and six by Japan. France and Italy, however, might each lay down 70,000 tons in capital ships to make up for the tonnage which each could have laid down in 1927 and 1929, but did not, in fact, begin to build. Moreover, to bring down the capital-ship strength of the British Empire, the United States, and Japan to the Washington figures of fifteen, fifteen, nine in the near future instead of in 1936, as allowed for in the Washington Treaty, it was laid down that Britain should dispose of the battleships *Benbow*, *Iron Duke*, *Marlborough*, and *Emperor of India*, together with the battle cruiser *Tiger*; the United States of three vessels; and Japan of one, within a certain time of the ratification of the London Treaty. Each of the Powers named, however, could retain one vessel for training purposes, provided she were suitably demilitarized.

The Treaty, it should be noted, says nothing of any reduction in the size and gun calibre of capital ships, and, although no vessels may be replaced during the " holiday " except in the case of accidental loss or destruction, the Washington figures of 35,000 tons and 16-inch guns still remain on record.

Aircraft Carriers.—The Washington Treaty defined an aircraft carrier as a surface vessel of more than 10,000 tons designed for the specific and exclusive purpose of carrying aircraft, and so constructed that aircraft could be flown off and on. The London Treaty amended this definition by omitting the 10,000-ton limit.

Two further paragraphs relating to the fitting of landing-on or flying-off platforms in vessels of all classes have already been mentioned.* It was further agreed that no aircraft carriers of less than 10,000 tons carrying guns heavier than 6.1 inch should be acquired by, constructed for, or built within the jurisdiction of, any of the High Contracting Parties.

Submarines. No submarines exceeding 2,000 tons, or with a gun above 5.1 inches in calibre, could be acquired or built by any of the

* See " Aircraft in Cruisers and Capital Ships."

Powers, though each Power might possess a maximum number of three submarines not exceeding 2,800 tons, which might carry guns not larger than 6.1 inch. Within this number France was also permitted to retain her 2,880-ton cruiser submarine *Surcouf*, already launched, and armed with 8-inch guns.

Vessels exempt from Limitation. The following types of vessels were exempted from limitation: first, naval surface combatant vessels of 600 tons displacement and less; second, naval surface combatant vessels exceeding 600 but not exceeding 2,000 tons, provided they did not carry a gun larger than a 6.1 inch; did not mount more than four guns above 3 inches in calibre; were not designed or fitted to fire torpedoes; and were not designed for a speed greater than 20 knots. Naval surface vessels not specifically built as fighting ships and employed on fleet duties, or as troop transports, etc., were also exempted from limitation subject to the restrictions already mentioned as to guns, torpedoes, and speed, and provided also that they were not protected by armour plate; were not designed or fitted to lay mines; were not fitted to receive aircraft on board from the air; did not mount more than one aircraft-launching apparatus on the centre-line, or two, one on each broadside; and, if fitted with any aircraft-launching apparatus, could not operate more than three aircraft at sea.

The rules covering exempt vessels are not unimportant, for, without infringing the Treaty, any nation can build small destroyers or torpedo boats of under 600 tons, with any speed or armament. They can also construct sloops or similar craft of between 600 and 2,000 tons with a speed of 20 knots or under, and armed with four 4.7 or 6-inch guns. Both these types of vessel would be useful in war, the first for anti-submarine purposes, and the second as escorts for convoys of merchantmen.

Age Limits for Cruisers, Destroyers, and Submarines. In Annex I to the Five-Power Treaty it is laid down that vessels shall be deemed to be " over age " when the following number of years have elapsed from the date of their completion: for surface vessels of between 3,000 and 10,000 tons (that is, cruisers), sixteen years if laid down before January 1st, 1919, and twenty years if laid down after December 31st, 1919. For surface vessels of 3,000 tons and less (that is, flotilla leaders and destroyers, the age limit was twelve years if laid down before January 1st, 1921, and sixteen years if laid down after December 31st, 1920. Submarines became over age after thirteen years.

Annex II gave the rules for the disposal of vessels of war, their scrapping, conversion into hulks, target vessels, or training ships, while Annex III gave a nominal list of " Special Vessels " such as minelayers, destroyer and submarine depot ships, despatch vessels, monitors, and sloops, which, though fighting vessels, did not enter any clearly defined category. Their tonnage was not included in the tonnage subject to limitation.

" Humanization " of Submarine Warfare. At all the Conferences which have taken place since the Great War, the British delegates, for reasons which are sufficiently obvious, have pressed for the total abolition of submarines. Their abolition, however, will never be agreed to by certain other Powers, so, to restrict what one may call their " frightfulness," the jurists and experts at the London Conference, as they had previously done at Washington eight years before, were set to work to

frame rules for the " humanization " of submarine warfare. As a result of their considerations, they laid down the following rules, which are embodied in Part IV of the Treaty:—

(1) In their action with regard to merchant ships, submarines must conform to the rules of International Law to which surface vessels are subject.

(2) In particular, except in the case of persistent refusal to stop on being duly summoned, or of active resistance to visit or search, a warship, whether surface vessel or submarine, may not sink or render incapable of navigation a merchant vessel without having first placed passengers, crew and ship's papers in a place of safety. For this purpose the ship's boats are not regarded as a place of safety unless the safety of the passengers and crew is assured, in the existing sea and weather conditions, by the proximity of land, or the presence of another vessel which is in a position to take them on board.

These rules are capable of very wide interpretation, and may be compared to rules of International Law already in existence forbidding, for instance, the use of lethal gas, and the dropping of incendiary or explosive bombs upon unfortified towns. Whether these new ordinances as to the gentlemanly conduct of submarine warfare will also be more honoured in the breach than in the observance by a country fighting for its existence, time alone can show.

PRINCESS MARY'S ROYAL AIR FORCE NURSING SERVICE

By Miss J. M. Cruickshank, C.B.E., R.R.C., Matron-in-Chief.

Introduction.

The privilege of writing the History of the Princess Mary's Royal Air Force Nursing Service is somewhat diminished by a sense of small ability for the task, but perhaps plain unvarnished facts will suffice. It is a history of eleven and a half years of continuous efforts, of disappointments, and of triumphs, but on the whole a happy history.

As an essential preliminary, a tribute must be paid to the memory of Miss Florence Nightingale, whose personal devotion, allied to the self-sacrificing service of her staff during the Crimean War, 1854-56, drew public attention to the value of skilled nursing, by women, for the sick and wounded, which resulted in the formation of the Nursing Services of the Crown.

History.

The Royal Air Force Nursing Service was formed in June, 1918, as a war measure, to meet the needs of the Royal Air Force. Its first establishment was a Matron-in-Chief, four Matrons and forty Sisters and Staff Nurses.

This small establishment did duty at station sick quarters at the training camps on Salisbury Plain and at Cranwell, Uxbridge, Glasgow, Birmingham and Sheffield, and at convalescent centres at Matlock and Hastings.

October, 1918, and January, 1919, saw the replacement of Army Nurses by Royal Air Force Nurses at existing hospitals in Blandford and Hampstead.

Nothing need be said of the conditions under which the nurses lived and worked during those early years, except that they loyally and cheerfully shared in the hardships and discomforts that were common to all ranks of the Air Force.

The return to peace conditions caused the gradual withdrawal of the Nursing Staffs from the temporary training camps, convalescent centres and hospitals, and the postings to hospitals on permanent training stations, at Halton and Cranwell, and to the Officers' Hospital at Avenue House, Finchley, to station sick quarters at Manston, Netheravon, Flowerdown, Henlow, Calshot and Leuchars. The Officers' Hospital at Avenue House, Finchley, was moved in 1925 to its present position, Uxbridge.

During 1919-20 a great service was rendered by Nursing Members of the Voluntary Aid Detachment, some 130 of whom were employed in the wards of the hospitals and at station sick quarters.

The question of the amalgamation of the Royal Air Force Nursing Service with the Army Nursing Service, as a measure of economy, was considered during April, 1919, and again in July, 1920, but as no appre-

ciable economy could be shown, it was decided that the two Services should remain apart. This decision was naturally received with great pleasure and pride by all members of the Nursing Service.

On January 27th, 1921, the Nursing Service was established under Royal Warrant as a permanent branch of the Royal Air Force.

In October, 1921, the Nursing Service Advisory Board was formed, with Sir Matthew Fell, K.C.B., C.M.G., F.R.C.P., K.H.P., Director of Medical Services as Chairman; and as members, Miss McIntosh, C.B.E., R.R.C., Matron of St. Bartholomew's Hospital, Miss Wilcox, R.R.C., Matron of King's College Hospital, and Miss Cruickshank, C.B.E., R.R.C., Matron-in-Chief, Royal Air Force Nursing Service.

In November, 1921, Air Vice-Marshal Munro, C.B., C.I.E., F.R.C.P.E., K.H.P., was appointed Director of Medical Services and succeeded Sir Matthew Fell as Chairman of the Advisory Board.

In 1926, Miss McIntosh resigned from the Board on relinquishing her appointment as Matron of St. Bartholomew's Hospital, and Miss Monk, C.B.E., R.R.C., Matron of the London Hospital, accepted an invitation to fill the vacancy.

The Royal Air Force Nursing Service was honoured in June, 1923, by His Most Gracious Majesty's consent and that of Her Royal Highness Princess Mary to the designation of:—

"Princess Mary's Royal Air Force Nursing Service."

No honour paid to our branch of the Service has given rise to greater pride than this mark of Royal recognition.

On October 31st, 1927, a further Royal honour was conferred on the Service when Her Royal Highness Princess Mary, Countess of Harewood, opened a modern well-equipped hospital and Nursing Sisters' quarters at Halton, Buckinghamshire, and graciously consented to the hospital being named after herself.

New Sisters' quarters were opened at Cranwell, Lincolnshire, in 1928, and it is hoped that the day is not far distant when the Nursing Staff at the Officers' Hospital will enjoy equally comfortable quarters.

Opportunities for foreign service came in 1922 when the Royal Air Force took over the command in Iraq: further opportunities for overseas service came with the Royal Air Force taking over the commands in Palestine in 1924 and Aden in 1928; these openings increased the popularity of the Service to a marked degree.

The foregoing are the principal landmarks in the history of the Service, but it may be of interest to refer briefly to the conditions of service and to the position and responsibilities of its members.

Constitution of the Service.

The constitution of the Service is: a Matron-in-Chief, Matrons, Senior Sisters, Sisters, and Staff Nurses. All the members are fully trained nurses, many of whom are also qualified in special branches of nursing, such as fever, tropical diseases, midwifery, massage and medical electricity.

Status.

The question of granting actual commissioned rank to members of the Nursing Service was considered in 1918, but was not recommended. Members were, however, given the status of officers and are accorded the same marks of respect as are prescribed for officers.

Conditions of Service.

The conditions of service are briefly as follows:—

Appointments are made by selection from candidates between the ages of 24 and 35 years, of good education, and who have qualified at a civil school under the regulations laid down by the General Nursing Council for England and Wales.

The pay and allowances are the same as those in the Sister Services.

Retirement.

A member may retire with a gratuity after ten or fifteen years' service and with a pension—the rate according to rank—on attaining 50 years of age or after twenty years' service. Compulsory retirement takes effect at 55.

Promotion.

Promotion from Staff Nurse to Sister is made after three years' efficient service, and to the higher ranks by selection as vacancies occur.

Temporary Service.

A percentage of the authorized establishment is of a temporary nature. The maximum age limit for these appointments is 40 years; they are on a contract basis of twelve months' duration renewable from time to time. A gratuity for each year of service, rate according to rank, is granted on completion of contract service.

Members under the age of 35 years at the time of appointment are eligible for transfer to the permanent establishment; when such transfer takes place, the whole of the service counts towards retired pay, provided that the gratuity for that period is forfeited.

Except where differences are specifically laid down in the regulations, the general conditions of temporary service are the same as for the permanent service.

Post-Graduate Courses of Study.

Members on the permanent establishment are permitted under specific conditions to attend civil schools for courses of study, during which time they are regarded as being on duty and receive full pay and allowances.

Uniform.

The uniform is at once neat, distinctive, practical, and professional.

Professional rank is indicated by rings of silk braid on the sleeves of service dress and Norfolk coat, and by shoulder straps on shoulder capes worn with indoor and mess dress.

Responsibilities.

The Matron-in-Chief is the advisor to the Air Council on all nursing matters relating to the administration of the branch—such as appointments, promotions, retirements, records, confidential reports—and on the nursing arrangements in Royal Air Force hospitals and station sick quarters where members of the Nursing Service are employed.

The Matrons are responsible for the general nursing arrangements of the hospitals to which they are appointed, the distribution of duties,

discipline, the general welfare of their respective staffs, and for the training of N.C.Os. and Airmen in nursing duties.

Senior Sisters have charge of one or other of the special departments of the hospitals, and assist the Matrons in their routine duties.

Sisters are directly responsible to the Matron in all matters relating to the ward under their charge, and to the Medical Officer for the carrying out of duties in connection with the treatment and nursing of the sick.

Staff Nurses carry out duties in connection with the nursing and treatment, and ward routine duties under the direction of the ward charge Sister.

Sisters stationed at sick quarters have the same responsibilities as those in hospitals, but have the advantage of greater opportunities for developing their administrative abilities and powers of initiative.

Advantages.

The Service offers many advantages—professional, educational and recreative. The opportunities for service and travel abroad are many. The educative value of lectures on current professional and general matters ensures to those who take advantage of the lectures a continuous training towards efficiency. The varied types of cases admitted to hospitals afford every opportunity for keeping in touch with, and gaining additional experience in, all branches of nursing—medical, surgical, tropical diseases, women and children. These opportunities are increased by the fact that members of the nursing staff take turns of duty in the various departments.

Recreation.

All members join in the social life of the station, and every encouragement is given and facilities afforded for sport. Members may join the golf, tennis and swimming clubs, and riding is a very popular form of recreation abroad. A Lawn Tennis Championship Cup is being competed for with great keenness this year.

The tenth anniversary of the formation of the Nursing Service was celebrated at a Reunion Dinner on September 21st, 1928, and was attended by a large number of past and present members and their friends.

At this dinner, which was held at the Hotel Cecil, where the Air Ministry was first installed on formation, those who had the privilege of serving with the Royal Air Force in the early years mentally contrasted the difference in the appearance and atmosphere of the room in which they were dining with that of 1918, when it was filled with busy officials surrounded by innumerable official documents.

Another and very important reunion, which Her Royal Highness Princess Mary, Countess of Harewood, has graciously consented to honour by her presence will be held on July 9th at Grosvenor House, Park Lane.

In conclusion, the life of a member whilst in the Service is designed to be a happy and a full one, and tends to the realization of the high calling of the Nursing profession, to the knowledge that it demands the cultivation of the highest qualities, spiritual, physical and moral, together with a sound knowledge of every branch of the work, and, above all, a sympathetic faculty for observation.

Such is the history of the Nursing Branch which has had the unique

distinction and privilege of growing up with the parent Service. Short as befits the history of a service, junior only in a mere count of years, this branch has worthily kept pace with other branches of the Air Force, and is distinguished by a loyal co-operation (the first essential of success) on the part of all members. So far as I am entitled to express my thanks, they are sincerely offered to all those whose untiring work has contributed so much to the high reputation for efficiency in which we rejoice. Whilst the Princess Mary's Royal Air Force Nursing Service possesses such loyalty, there is every confidence in its future well-being.

PUT IT IN WRITING

In a paper set at the qualifying examination for entrance to the Staff College some years ago, there was a question which must have astonished officers of the old school, but which is symptomatic of conditions in a modern Service. "What are your views," asked the examiner, "of the value, to all officers, of skill in the art of writing?" The question itself was prefaced by several quotations intended to give candidates a lead in writing their answers and implying that the efficiency of a military organization is dependent, in part at least, upon an officer personnel with some degree of skill in that art. We need not repeat the quotations, but we would point out the significance of such a question in an examination of this type. It was unusual enough to ask officers to evaluate skill in "pen-pushing," a side of the duties of the modern officer which is by no means popular and which is regarded with considerable contempt by not a few, especially by those bred in the tradition that a man of action has no time to devote to scribbling. But to introduce a vexed question by quotations, implying that skill in the art of writing is as necessary in war as the scientific use of the weapons of war, must have seemed like adding unforgivable insult to unnecessary injury in the eyes of officer candidates who had already spent many trying hours in writing answers to questions on the strategy and tactics of war by land, sea and air.

Yet, deprived of these quotations and viewed in cold blood, the question was not an unreasonable query to put to potential Staff Officers. Indeed it is one that every officer might profitably study and attempt to answer, for writing, in some form or other, is now part of the normal routine duty of all officers in a modern military Service. It is true that the Staff Officer wields the pen more often than his brother officers, but none can escape paper work entirely. In the course of his career every officer is compelled to do no small amount of written work, and there is every indication that the amount tends to increase every year. This tendency has not been allowed to develop unchallenged, for there is always a body of opinion, which, quite rightly, refuses to accept anything as inevitable, and which tries to keep new developments in check by placing positive obstacles in their way. Numerous devices have, therefore, been tried to prevent the rising tide of paper from drowning the personnel of the Services. We are not referring here to the skilful use of a "pending" tray in which letters are left indefinitely, in the hope that eventually they will answer themselves, but to more legitimate means of keeping down the volume of written work and making the essential minimum easy of composition. By the use of printed form letters in which blanks have to be filled with single words, by the standardization of the form of official correspondence, by trying to reduce official language to a series of conventional phrases and sentences, and by a number of other ingenious, but not always effective, measures, the amount of actual composition is kept down to the minimum.

There is much to be said for putting obstructions in the way of the

mere scribbler and of helping the non-literary officer in an unpalatable task. They put a partial stop to that curious, but apparently natural, desire some people have to multiply reports, returns and the like, merely for the sake of receiving them. They also prevent officers from becoming "office-wallahs" to the detriment of their other duties. Nevertheless, when all these devices have been taken into account, there still remains and always will remain a colossal amount of written work to be done, for the simple reason that it is an established Service practice to say "Put it in writing" whenever anything important or unusual has to be considered or decided. So long as this practice exists—and it is now so woven into the military fabric that not even the supreme acid test of that fabric, war, can shake it—so long will it be necessary for all officers to exhibit some skill in the art of writing.

It is incredible that any modern officer would subscribe to the view that skill in the art of writing is of no value whatever in his profession. One certainly cannot imagine such an officer surviving long or making much progress in a military service in the twentieth century. On the other hand, it would not be difficult to find officers who distrust writers, as a class, and who assume that an officer who can compose, and who enjoys composing, a well-written letter or report must necessarily be less of a man of action than one who deliberately cuts down paper work to the irreducible minimum because he has no natural aptitude for it. This view is due, in part, to a confusion of ideas. It is an English characteristic to regard an ounce of practice as worth more than several tons of theory. We place infinite faith in "common sense" and comparatively little in expert knowledge. The practical-minded have a certain amount of distrust for the theorist at all times. As writing is a mental process, it appeals to the type of mind which prefers thinking to doing. It is taken for granted, therefore, that a writer is more theoretical than practical in his outlook. If this be true, it follows that an officer whose special forte is writing is likely to have a preference for theory. Hence the fear that he may first develop an adversity to translating theory into practice and finally become a man who exalts theory over practice. In other words, some officers are afraid that too much writing will deprive them of the capacity for action and reduce the individual initiative which must always be the first essential in an officer in the emergency of war.

This point of view is probably derived from observation of the fact that the physically active often feel no natural desire for office work and from the fallacious argument that the converse must be true. It simply is not true that the brainworker is necessarily physically inactive. Nor is it correct to say that the man of action, using the expression in the best sense of one who can not only make quick decisions, but can also carry them through, must be a man of the type which ordinarily prefers physical activity to brain work. Thought must precede action. Ordered thought is more conducive to successful action than a semi-instinctive impulse based on so-called "common sense." Moreover, a properly trained officer never loses sight of his *raison d'être*. He knows that he must control and direct the activities of others, but he also appreciates that he cannot do this effectively unless he can participate in these activities himself. In addition, however, he knows that he has to supply the brain as well as the brawn. If he sees the matter clearly he will under-

stand that, whilst it is an advantage to be able to write well, since it is always advantageous to be able to perform any side of one's duty with the minimum of effort and the least possibility of error, it would be absurd to claim that skill in writing is of equal worth with rapidity of thought and of action. Nevertheless, this form of skill has something more than a merely relative value.

To belittle the importance of writing in the Service, or to suggest that it is immaterial whether a letter, say, is well or indifferently composed is to ignore the main purpose of all writing. We commit thoughts or opinions, facts or theories, information or queries to paper because we wish to transmit them to somebody else in a more permanent form than is afforded by speech. Our chief object should be to put them down in such a manner that they can be quickly and easily understood by whoever reads them. Above all, we must not be equivocal or express ourselves in such a way that what we have written conveys some different message from that intended, either because of ellipsis or sheer inaccuracy in composition. Whilst it is always possible for a reader to make a guess at a writer's meaning, it is sometimes very dangerous to compel him to do so by badly or carelessly constructed English. A guess is a gamble and, in war, may lead to disaster. The same danger is not present in peace, but peace training determines war practice. In the stress of war we automatically shed many of the habits of peace, but it would be a ridiculous system of peace training that encouraged bad habits in the belief that war will make us distinguish between good and bad habits and make us discard only the latter. If we belittle the habit of writing well merely because, in peace, there is usually time to prevent and to correct any positive errors due to guessing the meaning of a writer, who has little skill in the art of self-expression, we lay up trouble for ourselves when, as in war, the time element is reduced to a minimum.

In war a piece of paper may become the vital link in the military chain. To allow the writing on that piece of paper to leave its source of origin in such a form that it conveys a wrong impression to the reader of it, is to weaken the chain. If the writing is merely ungrammatical or incorrectly punctuated, the link in the chain is ill-forged, though it is not necessarily weak. In the interests of ordinary military efficiency, therefore, it is desirable that everybody to whom the duty of writing falls should have a certain degree of skill in the art. All that is required is that other people should be able to read what is written with complete and immediate understanding and without possibility of error. There is no need for what is termed a literary style. Nobody wants the "journalist" officer, but it is important that every officer should handle a pen with reasonable skill.

What is true of general efficiency is usually true of individual efficiency. So it may be well to add that nobody can express himself on paper unless he can think clearly and logically and that, often, indifferent composition is the result of muddled thought. The danger to others of an officer who cannot think clearly need not be emphasized. But what of the danger to himself? The officer who knows that all his faculties are trained to the highest pitch has greater confidence in himself. This confidence, providing it does not become undue self-confidence, is an important factor in success. Generally speaking, therefore, an officer who has mastered the art of writing has improved his prospects

of advancement if only because he has mastered the art of clear thinking. It is not suggested that an indifferent writer is necessarily an unsuccessful officer. This is palpably untrue. But an officer who has some skill as a writer must, *ipso facto*, have the advantage over one who is less able to express himself clearly on paper.

In conclusion, it must be said that it is a mistaken idea that ability to write is always an inherited or a natural gift; it can be, and often is, an acquired art. Writers in the literary sense may be born, but, so far as the Service is concerned, writers can be made. Let an officer take a pride in his written work and he will quickly find how easy it can be. Let him convert " Put it in writing " into " Put it in readable and accurate English," and he will achieve the same end with an added grace.

N. W.

TEST FLYING

By S. Scott-Hall, M.Sc., D.I.C., A.F.R.Ae.S.

There are many stages in the complete testing of an aeroplane. They begin with the first attempts at taxi-ing on the ground after the aircraft has left the erecting shops, and they do not end until it has been through the hands of a number of pilots, and has been subjected to a most searching examination as to flying and fighting qualities, performance, and structure. Indeed it is safe to say that no other type of craft or vehicle undergoes a more severe system of trials than the modern military aeroplane. This does not imply that the aircraft destined for commercial work escapes more easily. It does not, but the sole object in this case of the official trials carried out by the State is to ensure that the aeroplane is safe, whereas the military aircraft has to satisfy its examiners on many other points besides this one.

The testing of an aeroplane may be divided for convenience into two main parts, that which is carried out by the firm who have built it, and that carried out subsequently by the Government. The first part will not be dealt with at any great length here, as it has been the subject of a paper of recent date.*

Much of the flying carried out by the constructing firm is concerned with the proper harmonization of the controls in normal flight. This may involve small modifications of the aircraft. Aerobatic flight follows, finally ending with spinning and diving tests. All these tests are carried out again when the official trials are in progress.

During these tests, various other important points may have to be dealt with, very often in connection with the engine and its installation. Possibly excessive vibration in the mounting may be noticed, or oil-cooling may not be adequate.

The constructing firm will probably complete their tests by a measurement of performance. The accuracy of their data will depend largely on the instruments available for this work. A properly measured speed course is also nearly indispensable.

The problem of the best airscrew for the aeroplane can be solved, however, without elaborate measurements. Probably two or three different airscrews will have been designed for the aeroplane, and the final choice has to be made by actual flying tests. The choice will naturally depend on the duty to be carried out by the aircraft in service, and the specified requirements laid down for performance.

Recently the designer's problem has been further complicated by the development and extensive use of supercharged engines, and high-compression " gated " engines.

The characteristics of an airscrew may be fully determined at any chosen height by a series of Partial Climbs. The actual method of carrying out these climbs will be described later. It is sufficient here

* " Experimental Test Flying." Unwins. *Journal of the Royal Aeronautical Society*, May, 1929.

to say that they can be carried out quite readily, and no instruments beyond those normally fitted to an aircraft are required, except a strut thermometer and a stop-watch. Results can be compared very quickly, and the choice of the best airscrew can be made easily by the constructing firm, who are well advised if they carry out this work before sending the aircraft for its official tests.

All official trials of land aeroplanes are now carried out at Martlesham Heath. These include both military and civil aircraft, but, as the scope of the tests carried out for these two classes is widely different, they will be described separately.

Military Aircraft.

A military aeroplane usually has a history somewhat as follows. It makes its first appearance at Martlesham as an experimental aircraft built to a certain specification drawn up by the Air Ministry. It will probably be in competition at this stage in its career with other aircraft built to the same specification. They will all undergo what are known as Interim Trials. It is assumed that, as a result of these trials, the particular aeroplane under consideration is selected for further development. The development aircraft is built, making such modifications as are suggested by the results of the first trials. It then makes a second appearance at the Aeroplane and Armament Experimental Establishment—Martlesham's somewhat lengthy official title. The development aircraft undergoes full Type Trials. Finally the aeroplane goes into production for Service use, and the first-production aircraft pays a last visit for official tests, and full Type Trials are again carried out, in this case with the object of determining if any change in flying qualities or performance has occurred between the development and the production stages.

The aeroplane now says farewell to Martlesham for good, unless at some subsequent date drastic alterations are made to it to bring it up in line with later types, in which case it may be retested.

When an aeroplane arrives for trials, the weights on the wheels and tailskid are taken at once with the pilot or his equivalent in weight in the cockpit. The object of doing this will be shown later. The fuel and oil tanks are then drained, and care is taken to see that the radiator contains its correct amount of water.

The equipment on a military aircraft is divided into "fixed" and "removable" categories. This is all detailed in the Appendix "A," a copy of which accompanies the aeroplane wherever it goes. The aircraft will probably arrive for test with most of the items of fixed equipment on, and some of the removable as well. These items "on" are all checked up by the Appendix "A" and tabulated.

Meanwhile, the airscrew is removed and calibrated. The diameter, pitch and weight are measured, and compared with the corresponding values marked on it. It is then replaced.

The aeroplane is next weighed "light," without fuel, oil and crew, but with the items of equipment with which it arrived, and which have been tabulated, and with the radiator full in the case of a water-cooled engine.

The fuel tanks are filled carefully by "Bowser," and the aircraft weighed again. This gives the total fuel capacity by volume as recorded by the "Bowser," and as calculated by weight. These two figures can

be compared with the tankage as marked on the filler caps. Finally, the oil tanks are filled carefully, and the weight taken again. The filler cap on the oil tank will probably have been arranged so that the airspace necessary for working is left in the tank. In this case, the marked tank capacity will exceed the measured by this amount.

A specified list of equipment to be carried on trials will have been sent by the Air Ministry. This will include oil and fuel loads and details of crew. Using this in conjunction with the "light" weight of the aeroplane, and list of equipment "on," a loading sheet is made out in which the items of equipment still to go on are specified, together with details of their disposition. Whenever possible, actual equipment is used, otherwise dummy equipment correctly ballasted. Crew, fuel and oil are all included on this list, and added up to give a figure for the all-up flying weight on trials.

The aeroplane is now loaded according to this sheet. Whilst the loading is in progress the airspeed indicator and R.P.M. counters are taken out, and replaced by calibrated test instruments. A statoscope will also be fitted. This instrument is an aid when flying level, and consists of a small empty cylinder with communication to the atmosphere via a glass U-tube which is closed by a bubble of coloured liquid. So long as the pressure remains the same outside and inside the cylinder, that is, so long as the aircraft is flying level, the bubble remains in the centre of the glass tube. As soon, however, as the aeroplane starts to climb or descend, thus changing the pressure on the outside of the cylinder from that inside, the bubble starts to move one way or the other in the glass tube, and finally bursts. This enables the pressure inside and out to equalize so that, when a level height is once more maintained, the bubble will return to the centre of the tube.

The altimeter is not removed from the dashboard, as the test aneroid is usually carried strapped to the pilot's knee, a convenient place, and one where the instrument is saved from much vibration.

Modern aneroids used for test work are calibrated on the I.C.A.N. scale. This is a scale which takes into account the fall-off of temperature with height, whereas the older isothermal aneroid scale assumed that the temperature was 10 degrees centigrade at all heights. Thus the errors at high altitudes were very great. Of course, even for the I.C.A.N. aneroid a Standard Atmosphere had to be assumed in which the temperature fell at a certain rate as the height increased, but this lapse rate was chosen as the mean of many observations of actual atmospheric conditions in Central and Western Europe, and the temperature is rarely very widely different in this country from that of the Standard scale. The errors of the aneroid, at high altitude, are consequently much smaller.

When the aeroplane has been loaded up correctly for its tests the position of the centre of gravity is measured. To do this the aircraft is placed in three different attitudes, with the wheels and tailskid on a weighbridge and scales. The weights, angles of the wing chord relative to the ground, and various lengths are measured, from which the centre-of-gravity position can be calculated.

From the wheel and tail weights of the aircraft taken on its first arrival, the centre of gravity at that time can be estimated also, and it can be seen at once if the position has been altered much by the loading. Application is then made to the Air Ministry for a clearance to fly the

aeroplane under these conditions of total weight and centre-of-gravity position. This having been obtained, preliminary handling will be carried out to enable the pilots who will carry out the performance tests to get used to the aircraft. If any serious vice, such as bad instability or very poor controllability under any particular conditions, appears at this stage, it is reported immediately to the Air Ministry before tests are allowed to proceed farther.

The first test to be carried out is the determination of the Position Error.

It is well known that the airspeed indicator does not give a reading of true airspeed. First there is a correction depending on the density of the air in which the aircraft is flying, and secondly there is an error due to the position of the pitot head on the aeroplane. The first correction can be calculated easily if the temperature and height are known. The second correction has to be measured for each aircraft separately. Even in aeroplanes of the same type, this correction has often been found to vary, due chiefly to slight differences in the position and setting of the pitot head in the different aircraft. Careful mounting avoids this.

The quickest and easiest way of measuring the Position Error is to fly the aircraft over a straight measured course of about two or three miles in length. Such speed courses are commonly provided by railway companies, and, moreover, are usually furnished with a bridge or two. These form excellent points for sighting on. The aircraft will be flown level at a height of about 1,000 feet at top speed from a bridge near one end of the course to a bridge at the other end, and the time to travel between them measured with a stop-watch. The run will be repeated in the opposite direction to eliminate the effect of any wind. The mean airspeed-indicator reading, and the engine r.p.m. are noted for each run. The pilot will then choose another airspeed, say 10 m.p.h. less than top speed, and carry out a similar pair of runs at this speed. The speed is reduced in successive runs until control becomes too difficult near the stall. The air temperature and height of test are also noted. The test should not be carried out if there is any appreciable wind across the course, since, although corrections can be made for this, they are not reliable.

The distance between the two bridges can be measured up accurately from a large-scale map, and from the results the true speed over the ground corresponding to any given airspeed-indicator reading can be calculated. From these a curve of Position Error Correction for the aeroplane is drawn for the whole speed range.

Another way of determining this very important factor is to make use of the Suspended Air Log. The aeroplane can be flown level at any height for using this instrument. The log is lowered about fifty feet beneath the aeroplane where it is clear of all disturbances. It there records the true air distance travelled. By using a stop-watch in conjunction with this instrument, the true airspeed can be determined, and compared with the corresponding figure as calculated from the speed given by the A.S.I. in the pilot's cockpit.

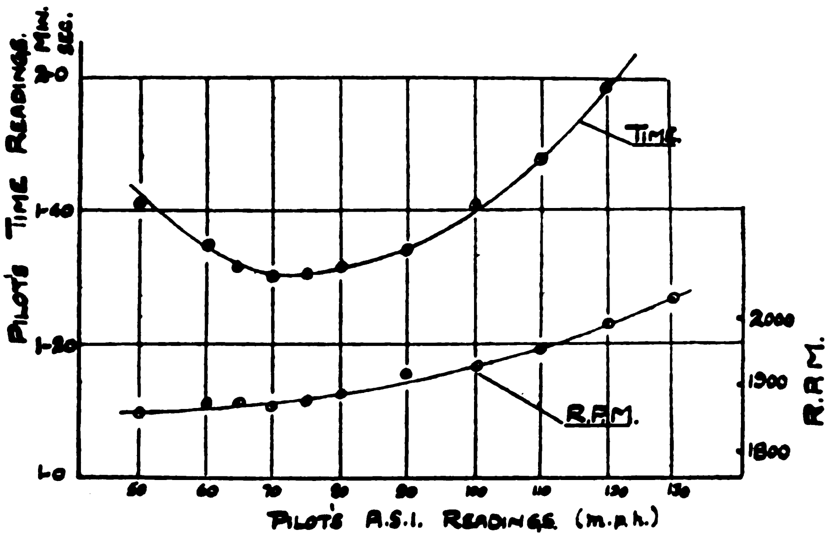
The advantage of the speed-course method is that it requires a crew of one only on board the aircraft, and is thus specially suited for single-seaters, whilst the air-log method, though eliminating any possible errors due to wind, requires a crew of two for operation.

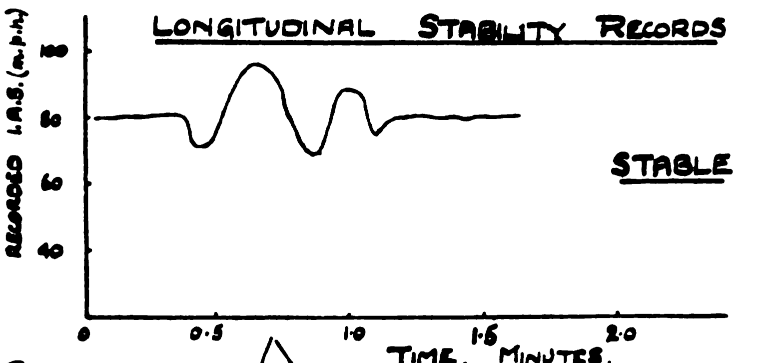
Partial Climbs are next carried out. From the pilot's view-point their

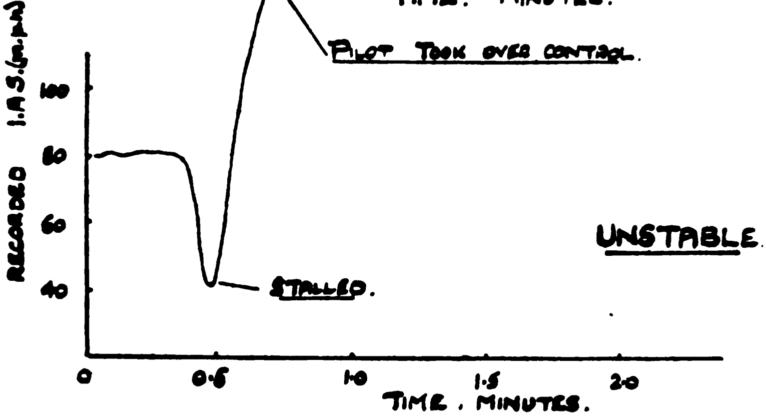
principal object is the determination of the best climbing speeds of the aeroplane at various heights. They are usually carried out at two convenient altitudes, roughly one-fifth and three-fifths of the ceiling, for an aircraft with a normally aspirated engine, though for an aircraft with a supercharged engine the lowest set of partials is carried out just above the "rated altitude," or height at which the engine may take full throttle. If the aircraft is undergoing full type trials, two further sets are obtained at two-fifths and four-fifths ceiling. To carry out a set of partial climbs at, say, 5,000 feet, the pilot will probably climb from 4,000 feet to 6,000 feet at a constant airspeed, first about 5 m.p.h. above stalling speed. He notes the time taken, the engine r.p.m., and the air temperatures at the beginning, middle, and end of the climb. He then descends to below the lower height, and repeats the climb at a speed of 10 m.p.h. faster. The whole climbing range is covered in this way, the climbs being carried out at intervals of 5 m.p.h. in the region of minimum time, *i.e.*, best climbing speed. The aircraft is then flown level at the mean height, and finally a partial descent is done at a speed 10 m.p.h. above the level speed. The readings obtained from this descent give a valuable check on the true level speed of the aeroplane at the mean height. All this flying is carried out at full throttle. A recording barograph is carried in the aeroplane. This gives a continuous record of height against time, and gives a check on all the pilot's readings. From the results, the best climbing speed is quickly obtained for the mean height. A similar speed is obtained from the second set of partials, and from these two, climbing speeds are calculated for the whole range from ground level to ceiling. These are then issued to the pilot who is to carry out the Full Climb.

The Full Climb on a high-performance single-seater aircraft is a very difficult piece of work by reason of the number of readings which have to be taken. Apart from flying the aeroplane at the correct scheduled airspeed, which is changing slowly as he ascends, the pilot has to take readings of time, air temperature, engine r.p.m., oil temperatures, and pressure, and altitude control. If the engine is water-cooled radiator temperatures are important, and if it is supercharged the boost-gauge readings are also required. If it were possible, all these readings should be obtained every 1,000 feet, but, as it is obviously not, the three most important—time to height, engine r.p.m., and air temperatures—are concentrated on, and the others obtained at wider intervals. The climb is continued to roughly Service ceiling or to a specified height. On the descent, the aeroplane is flown level for three minutes every 2,000 feet, the same observations being taken as before, with the exception of the time readings. Here again, as in the case of the partials, all the flying is carried out at full throttle. Generally two barographs are carried on a full climb to check on one another. The full-climb and level speeds are the most important parts of the performance tests, and are usually repeated once or even twice, and the mean results taken. Only in this way can the highest accuracy be ensured, and the effects of disturbed atmospheric conditions, and possible up or down currents, eliminated. A pilot, if he has not realized this, having carried out a test with the utmost care, and being absolutely confident of his readings, may naturally feel slightly aggrieved when he hears that his work is to be repeated, but he should understand that no slur is thereby cast upon his personal skill, or care in taking his readings.

PARTIAL CLIMB RESULTS.







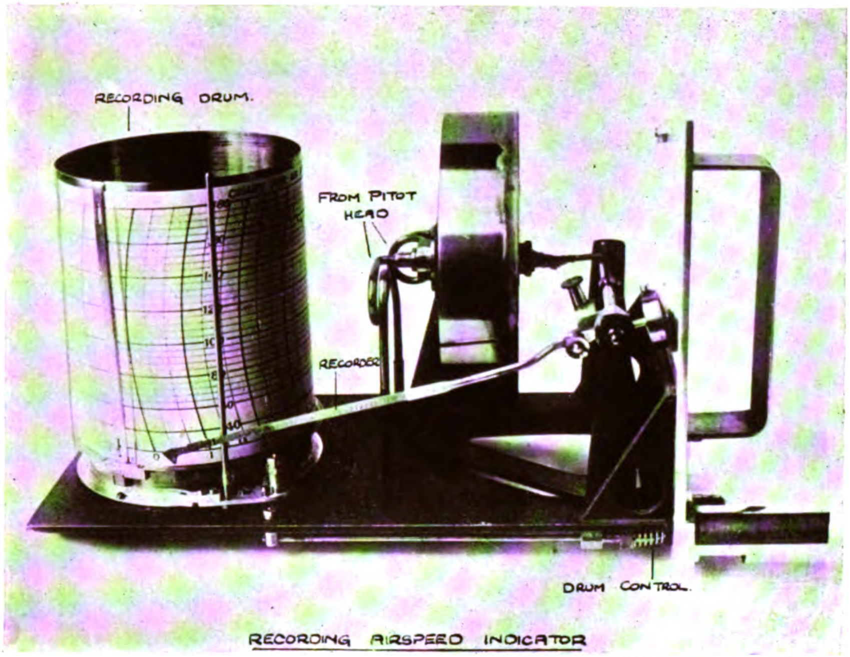
The results of all the air performance are reduced to what they would be in the Standard Atmosphere. This enables comparison to be made as between two sets obtained under different atmospheric conditions, or as between different aircraft. If the aeroplane has a normally aspirated engine, the reduction is carried out with the assumption that the engine power is a function of the atmospheric pressure. If the engine is supercharged a similar density law is assumed. Observations have so far shown these laws to be correct for the two types of engine.

The next important test on the list is known as Stick and Unstick. In this the take-off and landing qualities of the aircraft are determined. The quantities measured are: run to take-off, time to take-off, the height of the aeroplane above aerodrome level at a measured distance from the start of the run (this is estimated from photographs taken), the landing run, and the time of the landing run. If the aeroplane is fitted with wheel brakes the landing run is measured both with and without the brakes being used. The pilot should also obtain, as accurately as he can, his take-off and landing speeds. Naturally, Stick and Unstick results depend on the wind blowing at the time of test. Normally the test is not carried out in a wind of more than 5 m.p.h. near the ground, but if the results are required urgently the work may be done in winds up to 10 m.p.h., and the figures corrected for the actual wind velocity obtaining. Measurements of the wind speed are always taken at intervals during a test with a low-reading anemometer.

Next, Stalling Speeds must be measured.

This experiment is usually carried out at any convenient height where the air is calm, and the measurement is made whenever possible with a suspended air log, or, where this cannot be used, with a recording airspeed indicator. The stalling speed is measured both with engine in level flight and without engine on the glide, the pilot noting the reading of his airspeed indicator, thus giving a check on the recording instrument. The test is a difficult one to carry out, as most aeroplanes have some idiosyncrasy at the stall, and it is not easy to define accurately the actual burble point. On high-performance aircraft the estimate is particularly hard with the engine on, since the aeroplane will hang on its airscrew, and lateral control will probably disappear before the point of maximum lift is reached.

Longitudinal stability is particularly important for aircraft required to provide a steady gun platform, or to be used for accurate bombing. The recording instrument (A.S.I.) is fitted for examining this. The test is carried out at several speeds, including top speed, cruising speed, diving, and on the normal glide. The aeroplane is trimmed to fly hands-off at the chosen speed. The recording instrument is started, and the control column pulled back until the speed has decreased by 10 m.p.h. The stick is then released, and notes made of the subsequent behaviour. If the aircraft is stable, it will return to the trim speed after a series of oscillations which damp out more or less rapidly. If the stability is neutral, the oscillations will continue without altering in amplitude. If the aeroplane is unstable, the speed will continue to drop after the control column is released, until the stall is reached. The same experiment is carried out with the speed increased by 10 m.p.h. from the trim speed. In this case, the unstable aircraft will tend to go into a vertical dive. Many aircraft have forms of instability at high speeds, but it is an interesting fact that nearly every modern aeroplane is stable on the glide.



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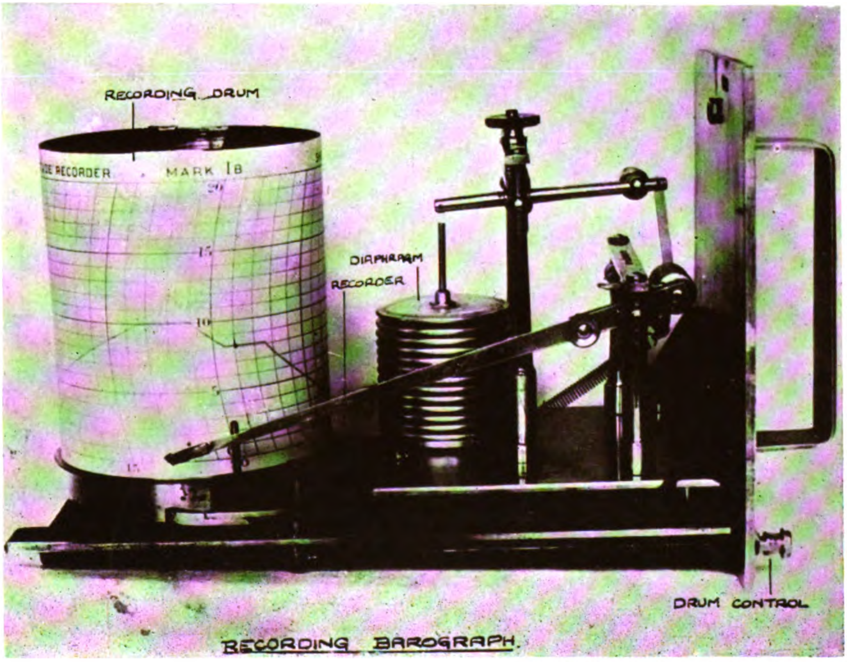

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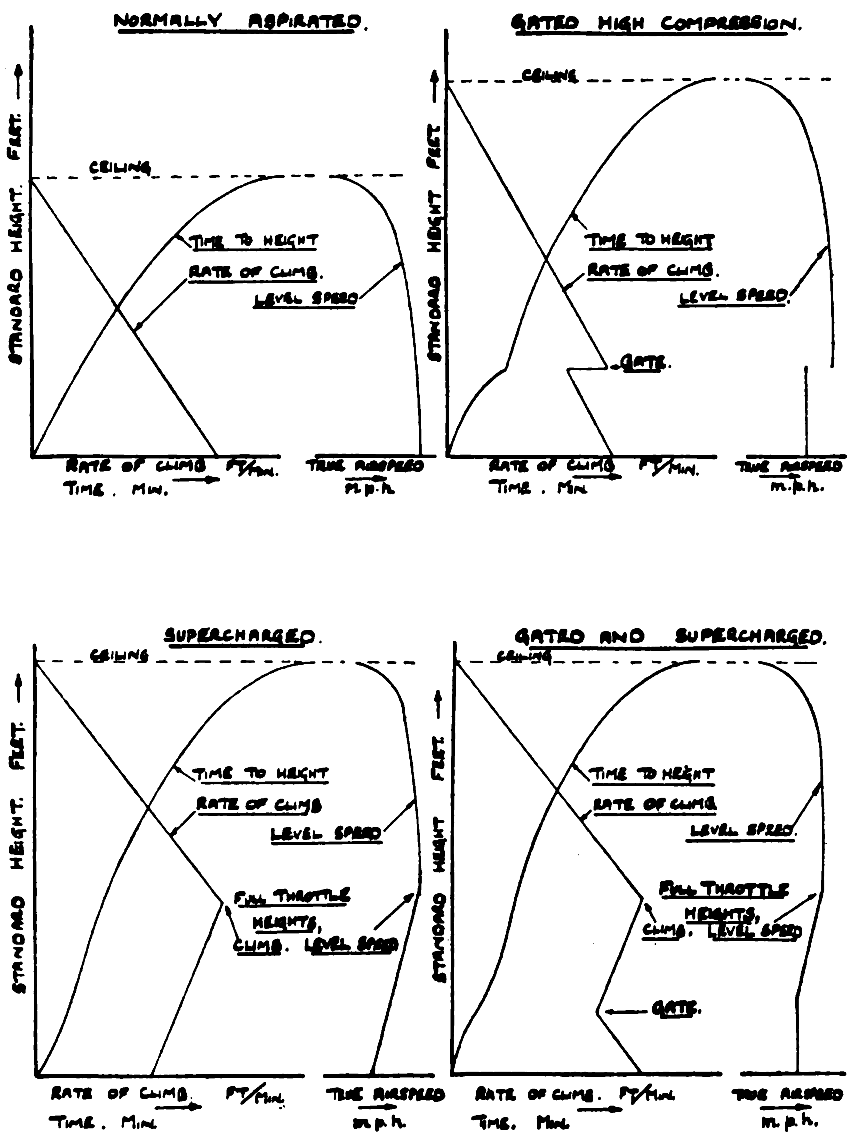
BUBBLE STATOSCOPE
BUBBLE

TYPICAL PERFORMANCE CURVES.



At about this period of the tests, enough flying will have been carried out on the aeroplane for the pilots to make out their interim handling notes, which deal with the flying qualities, comfort, any outstanding points on flight maintenance, and the general suitability of the aircraft for the particular work for which it was designed.

Finally, two extremely important tests have to be carried out—Spinning and Diving.

These are not insisted upon for every class of aircraft. Spinning, for instance, is not called for on twin-engine aeroplanes, nor do these undergo Terminal Velocity Diving, but, at the other end of the scale, the single-seater fighter has to carry out the full programme in these two tests.

Spinning is commenced with the centre of gravity at about the mid-position between the Air Ministry limits. A few preliminary short spins are carried out. If recovery seems satisfactory, prolonged spins of eight turns are carried out in each direction with the tail trimming gear set full forward. These are repeated with the tail trimming gear half-back, and finally full back. Recovery from a prolonged spin should be effected in three turns or under, after reversal of the controls, otherwise it cannot be regarded as satisfactory. The centre of gravity is now moved progressively aft to the rear limit, similar spins being carried out at each position. It is naturally at the rearmost position of the centre of gravity that difficulty in recovery may be expected. This is not the place for a detailed discussion of spinning, but it may be said that much more research work is needed before knowledge of this condition of flight becomes complete, and not until then will it be possible to predict with certainty from the original design that a particular aeroplane will have a perfectly satisfactory recovery from a prolonged spin.

The Terminal Velocity Dive is carried out with a view to ascertaining if any part of the aeroplane has a tendency to flutter, and to find out if there is aerodynamic instability of any kind. Several dives at progressively higher speeds are carried out before the final one is attempted. A recording airspeed indicator is carried, and the pilot is provided with a high-reading A.S.I. in the cockpit. With this and his aneroid, he can determine roughly the height at which the maximum speed occurs.

Needless to say, plenty of height must be left for recovery, and dives are usually started from 20,000 feet. The engine is throttled right back and switched off. An inspection of the structure is carried out by the Chief Engineer after the dive. A terminal velocity dive is not carried out on any aircraft on which the elevators are not interconnected, as there is a possibility of flutter being set up if the two sides are not rigidly attached to one another.

Components which are requiring more and more rigid tests on high-performance aircraft are the radiator and oil system. From the water and oil temperatures taken throughout the performance tests, the suitability is determined and reported upon.

Much important ground work will have been carried out during the period of the tests. The Chief Engineer will have carried out an examination enabling him to render a complete report on the structure. The drawing office staff will have taken particulars of all leading dimensions, and calculated tail and rudder volumes. Full photographs will have been taken.

The aeroplane next undergoes Armament Trials. The C.C. gear is

tested, and the Vickers guns are fired at the butts. Air Gunnery Trials may be carried out also, and a report is rendered by the armament staff.

This completes the work up to the interim stage. If the aeroplane is undergoing Full Type Trials, several further air tests are required. Apart from additional Partial and Full Climbs, Consumption Trials will be called for.

Consumption is measured, whenever the petrol-system arrangement permits, by means of a flowmeter. The R.A.E. type of instrument is now extremely accurate. Otherwise, the auxiliary-tank method is used, the engine being run off a measured tank under the required conditions of flight, until the tank has been emptied, the time to do this being taken.

Partial Glides are carried out, these giving useful information on the aerodynamic qualities of the aeroplane, apart from the power plant. The effect of the airscrew cannot be eliminated altogether, unfortunately, since it is impossible to make provision for stopping it, without elaborate modifications to the aircraft.

Maintenance Trials are so important from the Service point of view that, although they do not form part of the flying work, they should be mentioned. They are carried out under the supervision of the Chief Engineer, and measurement is made of the man-hours required for removing and refitting all components of the aircraft likely to require repair or renewal during service.

Civil Aircraft.

All civil aircraft are sent to Martlesham to carry out qualification trials for Certificates of Airworthiness. The severity and scope of these trials vary according to the class in which the aeroplane is placed. These classes are as follows:—

(*a*) Public Transport for Passengers.
(*b*) Public Transport for Mails.
(*c*) Public Transport for Goods.
(*d*) Private Aeroplanes.
(*e*) Air Work [Industrial, other than (*a*), (*b*) or (*c*)].
(*f*) Racing or Record Aeroplanes.
(*g*) Research or Experimental.

The greater number of civil aeroplanes fall into Classes (*a*) to (*d*). An aeroplane intended for air survey is a typical example of (*e*).

Aeroplanes intended for public transport for passengers must be able to attain a height of 1,378 feet (420 metres) in three minutes from leaving the ground. They have also to be capable of clearing 66 feet (20 metres) after travelling a distance of 546 yards (500 metres) from rest.

Aeroplanes in Classes (*b*) to (*e*) above must be able to attain 1,180 feet (360 metres) in three minutes, and clear 66 feet after travelling 656 yards (600 metres) from rest.

All aircraft in Classes (*a*) to (*e*) must be able to pull up on landing in less than 273 yards (250 metres). Wheel brakes may be used on this test if the aeroplane is fitted with them.

Finally, any aeroplane must satisfy the test pilots that its handling qualities are satisfactory in normal flight, and that the trim and stability are safe over the range of movement of the centre of gravity likely to be met with in service.

A certificate may be required for aerobatic as well as normal flight.

In this case, the test pilots must be satisfied that the aircraft will perform all usual manœuvres safely, and that no vices are displayed in aerobatic flight. Prolonged spins will be carried out, and recovery from these must be easy and rapid. High-speed dives will also be carried out, and the results of these must be satisfactory in character.

Aerobatics will be carried out at the extreme centre-of-gravity positions.

The aeroplane will have been examined on arrival, and subsequently during tests by the Chief Engineer, and the final report on the aircraft will include a section from him on the suitability or otherwise of the structure.

Competitions.

Comparing aircraft in competition with one another is no easy task. The performance figures can be written down in black and white, but the handling characteristics, structural methods and armament arrangement can only be subjected to qualitative and not quantitative comparison. These must always remain matters of individual opinion, and it is only by obtaining a number of expert opinions, and weighing up these opinions with great care, that a just verdict can be given.

The responsibility of any testing establishment is very great. Its creed should always be "Accuracy, impartiality, and an open mind."

The author takes entire responsibility for any statements or opinions expressed in this paper.

TELEVISION—AND ITS APPLICATION TO THE AIR STRATEGY OF THE FUTURE.*

INTRODUCTION.

TELEVISION, that is, the actual presentment of living, moving persons and events by means of wireless, has definitely arrived.

True it is still in its infancy, and is, perhaps, of more interest to the student than to the lay mind, but for all that no one conversant with the rapid and gigantic strides made by modern science can afford to dismiss the subject lightly.

To-morrow (I do not speak in terms of twenty-four hours, but of the Scientists' To-morrow, which may be a week hence, a year hence, or may be even as these lines are being penned) a sudden chance discovery may place perfected television among the commonplace.

Certain it is that a new era in scientific history is heralded by the advent of television, and that the application of this new science to air strategy should be carefully considered.

BRIEF STORY OF THE LEADING SYSTEMS.

Ever since 1870 various people in Europe and America have been striving to solve the many difficulties surrounding the transmission of light.

Some of the schemes put forward have been wildly impracticable; others have contained the germ of a practical idea but have not stood the acid test of demonstration; whilst a few—notably those of Baird, Karolus, Jenkins and Von Bronk, have achieved remarkable results.

The two chief obstacles to be surmounted were:—

(*a*) The light sensitive medium, which converts the modifications of light and shade in the object televised into electrical waves; and:

(*b*) The scanning system employed in exploring the object.

In the first, Selenium has been largely used, but owing to the lag in its response has been superseded by the Neon lamp or the Cathode Ray tube; whilst for the second, various ingenious devices have been patented.

Richeouloff has photo-electric and fluorescent points on the ends of two compound springs which are magnetically vibrated so that the points move over the surface of the image in close inclined lines. Where the image is bright the photo-electric point emits a large

* An article submitted by an Airman for "Competition No. 1" announced in our Editorial notices of the two previous numbers.

current, which is collected, amplified and transmitted to the receiver. When the point passes over a dark portion of the image the current is correspondingly small, so that the signal transmitted is weak.

Dr. Zworykin, of the Westinghouse Company of America, uses two prisms rotating at slightly differing speeds to effect spiral scanning with a complicated mirror system. J. L. Baird, among others, makes use of the Nipkow scanning disc patented in 1884.

The Baird System.

It is to the genius of John Logie Baird that Britain, and indeed the world, owes the first commercially practical system of television.

After many trials and tribulations he evolved a satisfactory televisor and accompanying receiver by which the Baird Television Development Company are now carrying out experimental transmissions through the British Broadcasting Corporation's station at Brookmans Park.

The Baird instrument consists broadly of a Nipkow scanning disc, a light sensitive cell, and a synchronous motor. The disc has thirty or so holes arranged in a single spiral so that when rotated they permit light rays from the object to pass through on to the light sensitive device. In this way the whole of the image is rapidly explored and the modulations in light and shade passed through to the light-cell, where they are changed from light waves into sound waves. These are amplified and radiated through the ordinary broadcast transmitter, to be picked up at the receiver, where, passed from the wireless amplifier to the television Neon tube, the sound signals are changed back into light waves which are passed through another disc rotating synchronously with the transmitting disc on to a screen where the image is seen.

Applications of Television.

It may be asked: What useful purpose will television serve other than in a purely entertainment sense?

In the first place, the educational factors in television should be obvious. The fact that a lecturer can show to his unseen audience the objects about which he is speaking, or can illustrate his information by drawings, will greatly enhance both the value and the interest of the wireless "talks," which, at present, are apt to be not a little boring. The broadcast of public functions will provide television with a factor of usefulness; it will make news live by the presentment in the homes of the masses of familiar personalities, for it is always some central personality which attracts the crowd to these functions.

Famous pictures, Music, and the Drama will all be made familiar to the man in the street by the medium of television, and by its aid he will be educated to a proper appreciation of them.

TELEVISION—AND AIR STRATEGY.

So much for the general applications of television. Now, to us of the Royal Air Force it will be more obvious still that this new branch of applied science possesses great potentialities as a vehicle for air intelligence. It may, possibly will, be charged against me that I am wandering into the byways of the problematical, but was not the same said of those who dared to predict before the war only one half of the benefits which aviation has since conferred on a wondering and sceptical humanity? Anyhow, I submit that the subject loses none of its interest because of an attempt to apply it to an unknown future. Wing-Commander A. G. R. Garrod, M.C., D.F.C., *p.s.a.*, writing on "Air Strategy" in the January (1930) number of THE ROYAL AIR FORCE QUARTERLY, said:—

> "The aim of the commander in an air war is the disorganization of the whole of the enemies' resources for military production, and this implies the obtaining of an entirely new kind of intelligence . . . ."

The necessary information regarding the disposal of an enemy's rear defences and means of communication and supply, including his factories and arsenals for the production of war material, are now gleaned by divers devious and dangerous means. Sometimes they are satisfactory and sometimes they fail in their object—information, vital and urgent, gets delayed until the time for its usefulness is past. Sometimes it never comes to hand at all.

Could television be used with advantage in this respect? It is possible.

But of greater interest would be the carrying of television transmitters in reconnaissance aircraft, so that the Staff, sitting before the receiver at G.H.Q., could *immediately see for themselves* the disposition of the enemy. This is not so fantastically futuristic as it appears on the surface.

With a telephone lens sharply focussing the country over which the aeroplane is travelling on to a ground glass screen, the scene could be scanned by the scanning disc in the ordinary way and the sound waves transmitted through the trailing aerial as at present used.

Innumerable problems remain to be worked out, of course, before this ideal is attained: The method of scanning and the response of the photo-electric cell to light impulses would both need a degree of acceleration commensurate with the speed of the aircraft. Strong lenses, capable of throwing the focussed landscape on to the ground glass screen with greater vividness than can anything at present extant, will have to be evolved. These technicalities, and others peculiar to the subject, will undoubtedly be thrashed out, since science—and television is indeed a science—must needs go forward to that inevitable Millennium to which all mankind is heading.

ENGINE RESEARCH

By Andrew Swan, B.Sc., A.M.I.C.E.

The Compression-Ignition Engine.

The use of the compression-ignition engine for aircraft is now attracting considerable attention, and certainly this engine has many desirable features to commend it. It can be operated at a high fuel economy with fuel of less fire risk than petrol, and the complication of electric ignition is not required. The carburettor and induction manifold are eliminated and replaced by fuel pumps and fuel injection valves. For equal cylinder content, however, the power obtained is inferior to that of the petrol engine, and, in consequence, the weight of the engine is greater. This important factor rather limits its use, at least as at present envisaged, to long-distance aircraft where the reduction in weight of fuel carried more than compensates for the increased engine weight. For take-off in these aircraft the smaller combined engine and fuel weight are particularly valuable, added to which a temporary increase in power can be easily obtained in the compression-ignition engine for the same purpose without excessive wastage of fuel.

Research on compression-ignition engines has followed along well-defined lines. Compression ratios of the order of 12 to 1 are used, high ratios being necessary to raise the temperature of the charge—air only is taken in—sufficiently to ignite the fuel on injection. The required quantity of fuel is metered by a pump and delivered at high pressure to a fuel valve in the cylinder head, from where it is sprayed into the combustion chamber. Injection is made just before top dead centre.

The fuel injection system and the combustion chamber design are obviously the main determining factors in the success of this type, and much experimental work has been done to establish basic data in connection with these. In contrast to the petrol engine, in which a carburetted mixture is drawn into the cylinder and the air and petrol are thoroughly mixed together during this period and later during compression, the time available for admixture of fuel and air in the compression-ignition engine is considerably less; in fact, it is only a few degrees of crankshaft rotation. Care has to be taken, therefore, that the fuel jets have sufficient penetrating power to pass to the other side of the combustion chamber without impinging unnecessarily on cool surfaces, and at the same time that each jet is suitably directed and the arrangement of all the jets is such that equal distribution of fuel and air is as far as possible attained. It will be readily understood that to realize this is a matter of considerable difficulty and, in consequence, for maximum fuel economy a fairly large excess of air has to be used and the power developed is much lower than is ideally possible. Greater power can be obtained by injecting more fuel, but with increase in fuel charge, and consequent reduction in excess air, the combustion is not so good and fuel is wasted.

The general practice is to make the combustion chamber of a compact shape; for example, the cylinder head and piston are made to form a

hemispherical chamber, so that no pockets of air are trapped which would be difficult to reach with the fuel jets. The number of jets varies in different engines and is dependent on the size and shape of the combustion chamber and the pressure of the fuel sprays. There is, however, a limit to the number of holes to the sprayer, because with a greater number the size of each would have to be reduced if the total quantity of fuel is to remain the same. This would necessitate very high fuel pressures to ensure the requisite penetration. A further difficulty is experienced in drilling these small holes accurately, and eight-thousandths

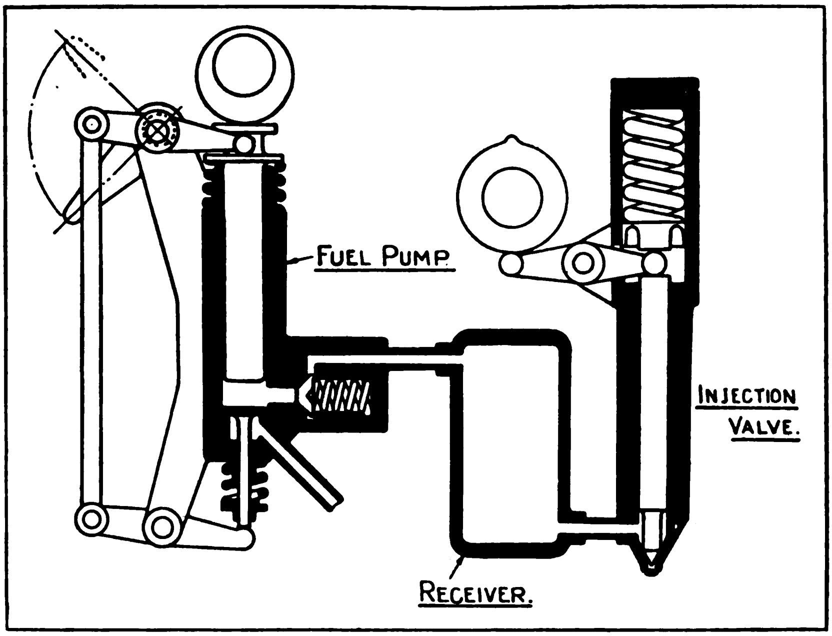


Fig. 1. Diagram of Fuel Injection System. 20 T Compression Ignition Unit.

of an inch is about the practical minimum. The best arrangement of holes, in number, size and direction, can be obtained only by practical experiment, in conjunction, of course, with a specific combustion shape, and it is found that sometimes a very small change in the system has a quite appreciable effect.

Five holes, each of .0145-inch diameter, were found to give the best results in the R.A.E. 20T. unit of 8-inch cylinder diameter by 11-inch stroke, on which very excellent results were obtained. The unit had a maximum speed of 1,200 r.p.m., representing a piston speed of 2,200 feet per minute, and, a b.m.e.p. of 100 lb. per square inch, a fuel consumption under .4 lb. per b.h.p. hour was easily obtained, the maximum explosion pressure being 800 lb. per square inch. This is at least 20 per cent. less than normal petrol engine consumptions. With the engine throttled down the consumptions are even better, because of the greater excess of air present to ensure complete combustion of the fuel.

The fuel injection system is shown diagrammatically in Fig. 1, and it will be noted that the injection valve in the centre of the head is operated by cam action, the time and period of opening being a matter of simple adjustment.

A more common form of ignition system in use is that known as the

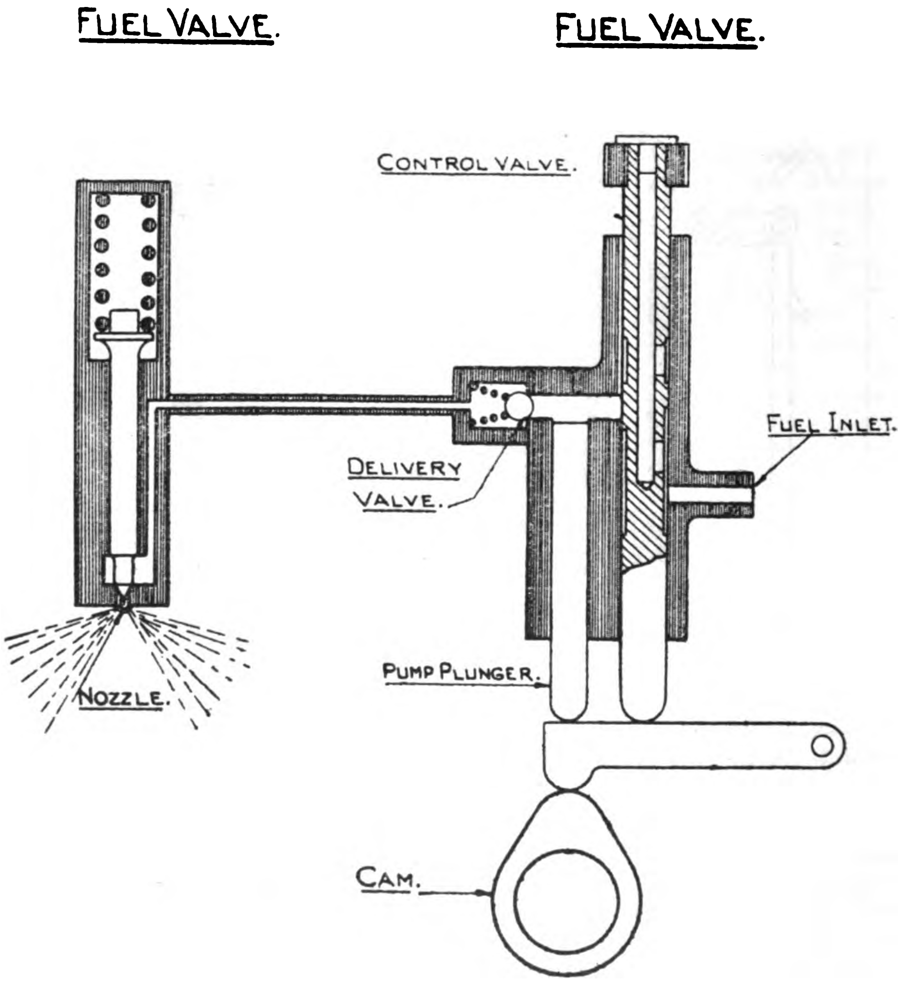


Fig. 2.

" jerk " pump type, in which the pump as before is also the metering device and the injection valve opens under the pressure of the fuel and is closed by means of a spring as soon as the desired quantity is passed and the fuel pressure reduced. The mechanical detail of this scheme is simpler than the former one described, and practically as good results have been obtained. Fig. 2 shows a diagrammatic view of the system, in which the control valve regulates the amount delivered by the pump.

In all systems of injections it is important to ensure a clean cut-off of fuel at the end of injection so as to avoid dribble, as fuel entering late in this manner, if burnt at all, is only burnt at a low-expansion ratio and not economically.

In the sleeve-valve engine designed by Ricardo a simple open nozzle is used, and distribution depends, not on the penetration of the air by the fuel, but on the swirl of the air past the jet. The air in entering the cylinder ports is given a rotational swirl, and this continues during compression into the combustion chamber. The combustion chamber is of cylindrical form and the nozzle injects vertically into it and near the outside wall. This is perhaps the simplest fuel injection system in use, and is, of course, associated with the swirl given to the air, a feature readily produced in the sleeve-valve engine. Very good results have been obtained and on a 5½-inch diameter by 7-inch stroke engine, running at 2,000 r.p.m. The maximum b.m.e.p. developed is 120 lb. per square inch and the minimum consumption is .355 lb. per b.h.p. hour. This consumption is obtained at a lower b.m.e.p. than that stated, but is maintained over a considerable range.

If the compression-ignition engine is to be used for high-altitude work it will probably be necessary to employ a supercharger to ensure that the air at the end of compression is at a sufficiently high temperature to promote combustion of the fuel; operation at medium altitudes of about 10,000 feet should, however, be possible without supercharging if a compression ratio of the order of 14 to 1 is to be used in the engine.

The Sleeve-Valve Engine.

Ricardo has done extensive research on the sleeve-valve engine, employing one sleeve only. In this engine the sleeve is given an up-and-down motion combined with a small rotation, and the path traced out by a point in the sleeve is an ellipse with the major axis parallel to the cylinder axis. To ensure good charging efficiency, some of the ports in the sleeve are used for the dual purpose of inlet and exhaust. The sleeve is made of specially hardened alloy steel and withstands many hundreds of hours' running without appreciable wear or distortion. With the absence of hot exhaust valves it is found that higher compression ratios are possible without detonation, and in consequence increased power with reduced fuel consumptions are obtained.

The usual carburettor and induction system is used in these engines, but an alternative method of petrol injection is also employed, the petrol being injected under a small air pressure in the form of a very rich mixture. In this system air charge only is taken in through the inlet ports and it is then possible to fit "ramming" pipes to these, by means of which a supercharged effect can be realized. The "ramming" pipes are just plain pipes of a length usually from 2 feet to 4 feet as determined from experiments in any particular case, and the supercharge obtained appears to be due to the ramming effect of the column of air in the pipes once it is set in motion by the suction of the engine.

The extra power obtained by their use is very appreciable, and b.m.e.p's. of 160 lb. per square inch have been realized. The fuel injection system worked satisfactorily, and consumption could be controlled to the minimum requirements over a wide range of power.

Torsional Vibration of Engines.

This is a subject which has received considerable attention and investigation recently, and much has been done to elucidate a very difficult and complex problem. All engine crankshafts are subject to torsional resonance, and if the natural vibration of the crankshaft and its associated masses comes within the running range of the engine, overstressing of the shaft will result with consequent failure. Its effects are not always confined to the crankshaft, and failure may appear in other components, particularly the accessories if driven from the rear end of the shaft, owing to the excessive amplitude of torsional movement of that point of the shaft.

The engine crankshaft system can be compared in its simplest form to two flywheel masses connected to opposite ends of a shaft suitably held. These masses can then be set into oscillation torsionally with a frequency depending upon the inertia of the masses and the stiffness of the connecting shaft. The masses will oscillate in opposite directions about a stationary point or node in the shaft.

Such a system appears in the radial engine, the airscrew being one flywheel mass connected by means of the crankshaft to the other mass composed of the crank throw, connecting rod and reciprocating masses. In multi-throw crankshafts the system is similar, except that each crank-throw and its accompanying masses represent a separate flywheel mass giving, instead of the simple case of two flywheel masses, a number of these spaced at intervals along the shaft. The firing impulses of the engine cause the system to vibrate torsionally and when the impulses are given at such a rate that the system is set into free vibration, excessive amplitude of movement can be set up. In multi-throw shafts the modes of torsional vibration are many and oscillation occurs at several frequencies corresponding to different engine speeds.

The theory of torsional resonance is well understood, but considerable difficulty was experienced in correlating theory and the effects as observed, owing to the differences between the actual system and the ideal assumed. The masses are not true flywheel masses and certain assumptions had to be made in determining the equivalent rotating mass to represent the reciprocating piston and part connecting rod of each cylinder. The crank-throw also, while acting as a rotating mass, is part of the connecting shaft between the masses. The largest discrepancy, however, between theory and practice lay in the value given to the stiffness of the shaft, the determination by calculation of the stiffness of the crank-throw being particularly difficult and liable to error.

As a result of data obtained from many static torsion tests of shafts, a formula for stiffness has now been derived which gives the value to a very fair degree of accuracy; also the other assumptions as to the masses have been verified by experiment and it is now possible in the design stage to calculate the natural frequency of an engine shaft system and to say if trouble is likely to arise within the running-speed range.

To aid and check the investigations a torsiograph developed at the Royal Aircraft Establishment has been used. This instrument fits into the hollow portion of the airscrew shaft and measures the relative twist occurring between two points of the shaft. By a system of leverage and mirrors a record of the twist during the course of one or more revolutions when running under power can be photographed, the

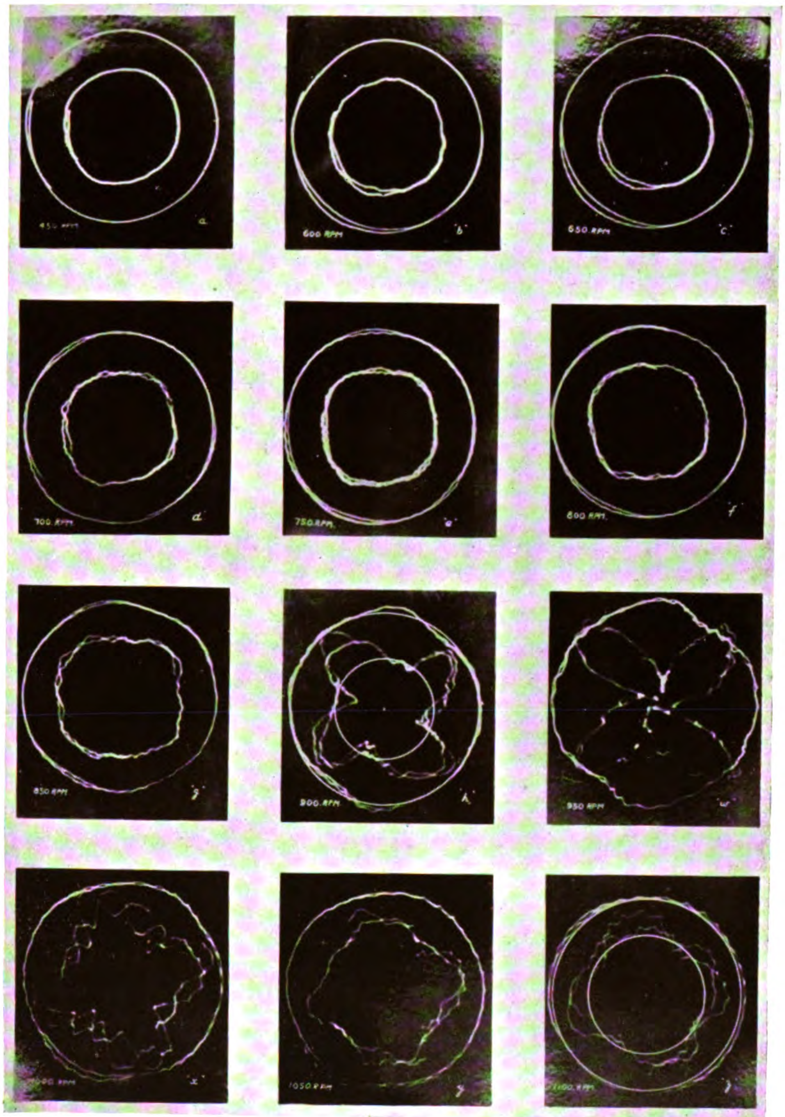


Fig. 3.—Torsional Vibration Diagrams.

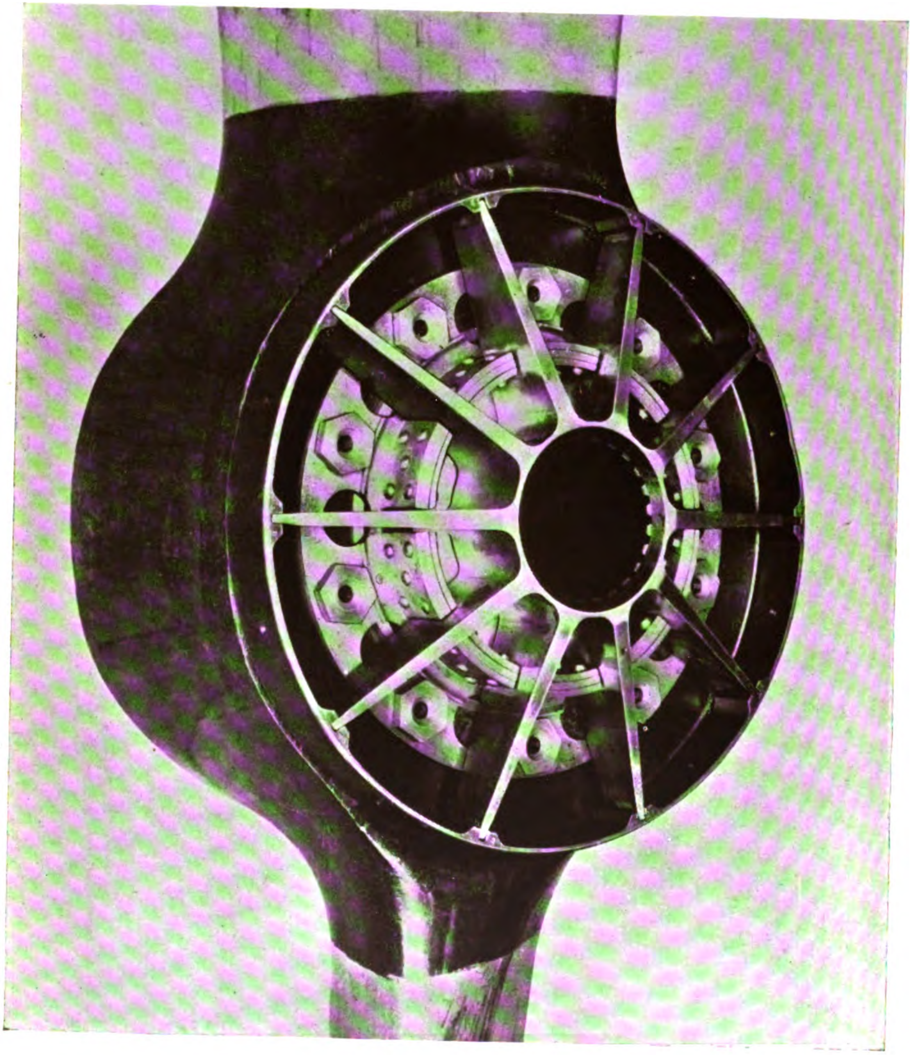


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Fig. 4.—Flexible Hub designed to avoid Torsional Vibration.

diagrams obtained being a polar one and the amplitude of twist or vibration being denoted by movement of the diagram radially outwards. A series of diagrams taken from an engine are shown in Fig. 3, and it will be noted that synchronous vibration is represented by an excessive amplitude of twist at a speed of 950 r.p.m. The outer circle of these diagrams is only a zero or reference circle from which the amplitudes of movement of the inner diagram can be measured.

By altering the stiffness of the crankshaft, the speeds at which synchronism takes place can be moved up or down, depending on whether a greater or lesser stiffness has been employed. Alteration in the masses has a similar effect, but is, as a rule, more difficult to do than the former without drastic change in design.

Theory indicates that to obtain the smoothest running throughout the speed range it is best to arrange for the main synchronous speed to occur at a very low engine speed where little or no running would be done. To do this requires a considerable reduction in stiffness and is not easy to realize unless the shaft is made unduly weak or a long airscrew portion is used. In geared engines usually the effect of the gears and the additional piece of shaft is to lower the synchronous speed appreciably.

Where these means of reducing the stiffness cannot be employed, a method adopted is to introduce the necessary flexibility by the use of a flexible hub. Such a device gives a greatly reduced stiffness without adding appreciably to the dimensions of the engine, and a form of hub developed at the R.A.E. for this purpose is shown in Fig. 4. It consists of a normal type airscrew hub which, however, floats on the shaft and is driven by means of the radial spring arms, the central boss of these arms being firmly splined to the shaft in the usual way. Confirmation of the theory has been obtained by practical test of a flexible hub on an engine, and diagrams obtained (see Fig. 5) by means of the torsiograph instrument show very clearly the gain in smooth running to be had if the main synchronous speed is arranged to be well below the running speeds of the engine. The synchronous speed occurs in this case about 625 r.p.m., but, as stops were fitted to the hub to prevent excessive movement, the full amplitude of vibration is not shown and is broken where the stops came into action.

Whether the reduced stiffness of the crankshaft should be obtained by orthodox design of shaft or by the use of a flexible hub or other similar device is a matter which is dependent on the type of engine being dealt with and how far its construction lends itself to the incorporation of the necessary modifications.

Fuel Economy.

Consideration of long-distance flying, and possibly also the shadow cast by the compression ignition with its low fuel consumption, has given a much-needed impetus to an examination of the possibility of improving the fuel consumption of petrol engines. Experiments have shown that fuel economy can be improved under special or closely defined conditions of running, and it remains for carburettor design, which, however, has to cater for a wide range of duty, to embody modifications to meet these conditions. A recent modification has been the use of a small pump embodied in the carburettor to give, in opening the throttle, a supply

of petrol for quick opening up of the engine. This separation of the very necessary provision for rapid acceleration should enable the carburettor to be more closely tuned for throttle and power running, as hitherto the tuning was rich enough to include this feature.

Present fuel economies are, however, very much dependent on whether or not the altitude control is used to the best advantage. As is well known, the setting of a carburettor for maximum power on the ground gives a mixture which becomes increasingly rich as height is gained, and to compensate for this the altitude control cock is progressively opened with altitude. In modern carburettors the opening of this cock has the effect of destroying the depression over the diffuser and, in consequence, reduces the quantity of petrol supplied. The amount of opening necessary to give the proper mixture strength for a flight at any specified height can best be determined by gradually opening the cock until the engine revolutions begin to drop, then closing it just sufficiently to restore the revolutions. For a flight of several aircraft, therefore, unless this cock is used to the best advantage, a considerable variation in the fuel consumed by each aircraft may result and the flying range would accordingly be limited to that of the aircraft consuming the most fuel. Actual flight tests of a number of aircraft, without an attempt being made to obtain uniformity of consumption, showed the possibility of wide variation, although when operating under controlled conditions the variation was much reduced and could be below 5 per cent.

This consistency of consumption can be aided in great measure by the use of the R.A.E. flowmeter, a simple instrument easily installed in aircraft, and which is graduated to read the rate of fuel consumption per hour. With this flowmeter in use, a flight could be made by a number of similarly engined aircraft at an economical rate of fuel consumption yet sufficiently above the minimum consumption to ensure a margin for any differences arising in the engines and for keeping formation.

Engine Silencing.

The reduction of noise of aircraft is a matter perhaps of more interest to those concerned with civil aviation than to the Service, but even for the latter it is not without benefit. There is no question that extreme noise as experienced in aircraft is a source of discomfort to most people, and any reduction it is possible to make would have an important effect and go far to widen the appeal of flying.

The chief causes of the noise are the airscrew and the engine, and, of the latter, the sources of noise can be divided into that produced by the engine mechanism running at high speed and that produced by the exhaust. The noise produced by the airscrew, the engine mechanism, and engine exhaust are roughly of the same order and are generally above the threshold of discomfort. It is therefore not sufficient to reduce the noise of one of these without a corresponding reduction of noise in the others.

Much can be done to lessen the noise from the airscrew by reducing the tip speed, and the geared engine, with its lower airscrew, holds out promise of being quieter than the direct-drive engine. Reduction of noise produced by the engine mechanism, however, is not an easy problem, and the present tendency for higher speeds does not simplify matters, as the noise appreciably increases with speed. It may be that

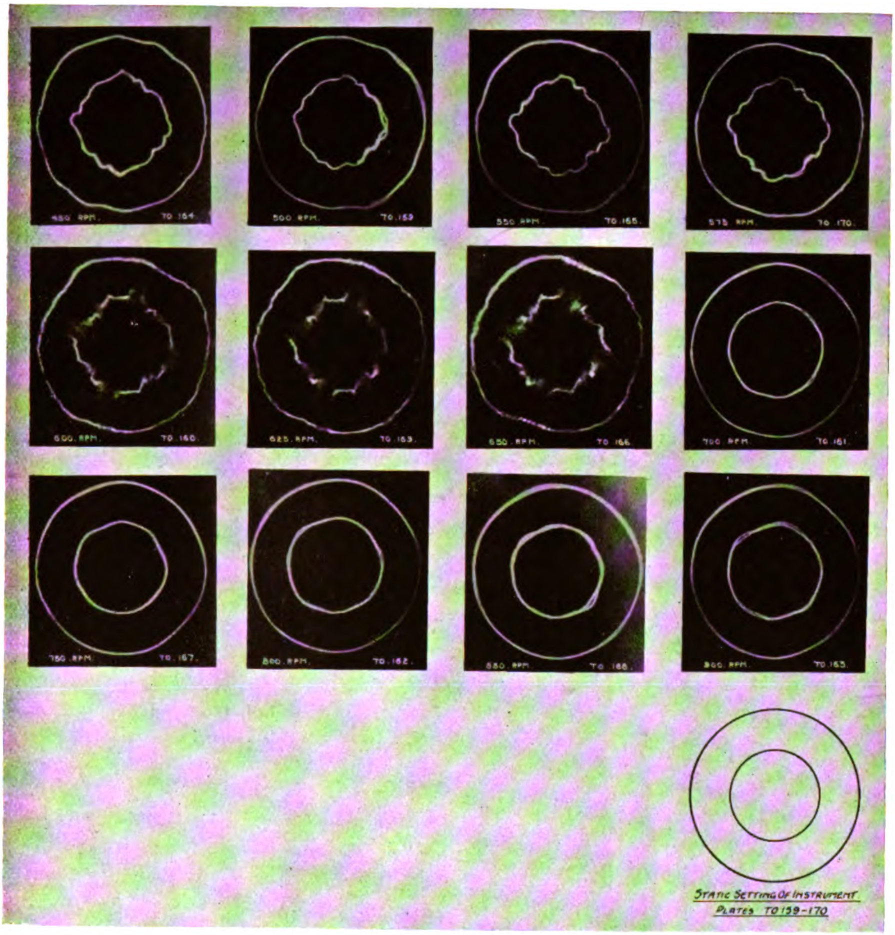

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Fig. 5. Torsional Vibration Diagrams, showing effect of Flexible Hub.

attention to detail design with this object in view would make a considerable difference.

As regards the engine exhaust, the number of silencers produced for this purpose have been very many, but most of them have failed because they have had little or no effect, and of the others a large number have failed because they were too cumbersome or heavy, and others on account of the undue depreciation in engine power caused by the back pressure set up in the exhaust. In effect, exhaust silence, or at least a very appreciable reduction in engine exhaust noise, can be obtained, but at a price in weight carried or loss in power at present inacceptable.

Exhaust rings, as now fitted to radial engines, have a considerable silencing effect owing to the large increase in volume available, and if the exhaust be then led through pipes and discharged behind the occupants of the aircraft a further improvement is obtained. For engines not fitted with exhaust rings the best silencer so far obtained, taking into consideration also its weight and installation qualities, is the long pipe perforated with a large number of small holes throughout approximately the last 10 feet of its length. In multi-engined aircraft it is not always possible to obtain the full length desirable and the maximum length is determined by the wing chord, but even the use of this length has a marked effect and the noise is still further masked from the occupants if the pipe passes under the bottom wing.

SINGLE-SEATER OR TWO-SEATER FIGHTER?

By Wing-Commander M. Henderson, D.S.O., *p.s.a.*, R.A.F.

The relative merits of the single-seater and two-seater fighter are questions which are frequently debated in Service circles.

The writer believes that the subject is best examined from two points of view; *i.e.*:—

The purely Home Defence fighter and what may be called, for lack of a better term, the " General Purpose " fighter. By the latter is meant the type of aircraft required for use with an expeditionary force or in the Overseas garrisons.

(1) Home Defence Requirements.

The Home Defence fighter must be designed primarily for use against bomber aircraft, and it must be remembered that its use and value are governed to a very large extent by the time factor.

The time which will elapse between the crossing of the coast or frontier line by the enemy and his arrival over the target will be very short, and it will therefore be absolutely necessary to attack and defeat him as soon, and as far from his objective, as possible.

In order to effect this, the H.D. fighter must be capable, in the shortest possible time of

(*a*) Obtaining the altitude gauge of the enemy; and
(*b*) Bringing superior concentration of fire to bear.

Obtaining the altitude gauge of the enemy. The single-seater, by reason of its lighter load and consequent superior speed, climb and manœuvrability, is superior to the two-seater in this capacity, as, not only can it gain more quickly the initial advantage in altitude, but it is also capable of regaining it quickly after delivering an attack.

Bringing superior concentration of fire to bear. The two-seater not only carries superior gun power, but is also capable of a much greater degree of all-round fire than the single-seater, which is limited to ahead fire only.

It follows, therefore, that the two-seater is capable of carrying out a more sustained attack than the single-seater, since it can still bring fire to bear on the enemy during the period of turning away after delivering a frontal attack, whilst the single-seater must turn in order to carry on the attack once it has passed the enemy.

It is obvious from the above that neither the single-seater nor the two-seater fighter is definitely superior to the other in both the requirements set out in (*a*) and (*b*) above.

Type of opposition to be expected. In considering the enemy aircraft to be attacked, day bombers, it is at once obvious that such aircraft will be heavily loaded, since they will endeavour to carry as large a load of

bombs to the target as possible, and will, therefore, be comparatively slow, not easily manœuvred, and heavily armed. They will probably be unescorted and will rely for defence on good station keeping.

It should, therefore, be easy for two-seater fighters, less heavily loaded, to obtain the altitude gauge, whilst their superior fire power, compared with the fire power of a single-seater, would be very valuable and necessary against the heavily armed enemy bombers.

The most favoured method of attack on a formation of such aircraft by fighters consists of rapidly closing with the enemy from the side or rear with superior concentration of fire and, after attacking with front guns on converging courses, turning away on deviating courses to re-form and renew the attack as soon as possible.

If such an attack is carried out by single-seater fighters their fire power ceases as soon as the turn-away commences, and the enemy is able to bring fire to bear on the attacker without reply.

In the same attack by the two-seater fighter, the back gunner is able to continue the attack started by the front gun after his aircraft has turned away and to continue it until out of range, or until the attacking formation has re-formed and is ready to renew the attack.

The enemy formation is, therefore, under a continuous fire.

Possibility of enemy escort of fighter aircraft. It is possible, however, that the enemy bombers may be escorted by fighter aircraft, and if this is so it would be necessary to oppose them with fighter aircraft of at least equal performance and gun power.

It is reasonable to assume that the enemy escorting fighters would be two-seaters. Their escort duties would consist of a great deal of " rearguard " work, a type of fighting for which the single-seater is very unfitted by reason of its complete lack of fire power behind.

The escorting fighters, moreover, must have a larger fuel load than the defending fighters, since the latter will work comparatively close to their aerodromes, whilst the former will be operating, during a large part of their flight, far from their base.

It seems, therefore, that even against an escorted hostile bomber formation, the H.D. two-seater fighter should hold a definite advantage.

Probably the ideal is to have available both single-seater and two-seater fighters for this H.D. work: the single-seater to concentrate on engaging and drawing off the fighter escort of the enemy bombers, the two-seater fighters to attack the bombers themselves.

Conclusion. Multiplicity of types is, however, undesirable for several reasons: economy, complications of training, supply of spares, supply and training of personnel are some of the more important, and the conclusion seems reasonable that the two-seater, high-performance, medium-range fighter should be the most satisfactory type for purely H.D. work.

(2) Requirements in Relation to our Expeditionary Force and Overseas Garrison Obligations.

It remains now to examine this problem from the other point of view.

Type of war. Before examining in detail the requirements of the fighter aircraft to accompany the expeditionary force, it is advisable to discuss the type of war in which this force is likely to be engaged.

It may be assumed that it will be a " non-European " war; that is,

that it will not be fought in Central or Western Europe, or against a Power superior in aircraft.

The possible exception to such an assumption is a " Locarno " war; that is, a war in which we might become engaged in fulfilment of our obligations under the Locarno Treaty and in defence of one of the European signatories of that Treaty.

It is probable that in any such war our Air Force would be called upon to play only a secondary rôle and be employed principally in providing the necessary air co-operation for any Navy and Army formations engaged.

The type of war most likely to occur, and with which we now propose to deal, is a mobile war in the Middle or Far East, involving an overseas expedition, the formation of operational bases, and a long period of consolidation and deployment before contact is made between the opposing land forces and a decision becomes possible.

Rôle of the Air Force. In the opening stages of such a war, the rôle of the Air Force will be to cover the landing of the expedition and delay the enemy preparations for concentration and deployment.

Such covering work will probably have to be carried out either by aircraft already based there, if the landing is in friendly territory, or by fighter aircraft from the covering force of the Navy.

The expeditionary force aircraft will not be available until they can operate from an aerodrome established ashore.

Once the expedition has been established ashore, the defence of the base will become the responsibility primarily of the A.A. formations accompanying it, since the allocation of aircraft for purely defensive work is uneconomical.

All available aircraft must at once be concentrated on attacking the vital centres of the enemy in the form of sustained bombing.

Rôle of Fighter Aircraft. The rôle of the fighter aircraft at this stage will be to keep the opposing fighters under control, in order to clear the way for the bombers, and, to do so, they will probably have to look for their opponents close to his aerodromes, since these are the most likely places to make contact.

These aerodromes will probably be situated some distance from our own fighters' bases, and the fighters must therefore be capable of long flights to and from their objective and be able to fight sustained actions there and on their return journey.

Much of this fighting will take the form of rearguard fighting, since the enemy, being over his own country, will be able to choose the most favourable moment for breaking off the fight. In our fighters, therefore, all-round fire, and back-gun fire particularly, will be essential.

Rapid climb and high speed are desirable, but not so essential as endurance and fire power in such circumstances.

Type of Aircraft required. It seems, therefore, that the type of aircraft required is one capable of

(*a*) Long endurance;
(*b*) Sustained fighting power;
(*c*) All-round field of fire;

and, in a lesser degree,

(*d*) High speed;
(*e*) Rapid climb.

The type which fulfils these conditions best seems to be a two-seater fighter of the kind already proposed for Home Defence work, but with a greater fuel-carrying capacity.

A two-seater is essential in order to obtain the necessary all-round fire, and increased fuel capacity is obtainable by modifying the pure Home Defence type and by increasing the load at a small sacrifice of speed and climb.

Conclusion. It seems that the two-seater fighter has a very definite place in air strategy, both for H.D. work and for mobile warfare of the type in which the expeditionary force is being trained.

It is not suggested that the single-seater fighter has not a very definite value; it would be interesting to hear the opinion of the Fleet Air Arm as to the possibilities of the two-seater fighter for fleet fighter work, whilst it seems that for purely interception work the single-seater is indispensable.

It is felt, however, that the value and possibilities of the two-seater fighter may have been lost sight of temporarily, owing to the success of the single-seater in the abnormal conditions prevailing on the Western Front during 1917-18, and to the concentrated study, during the formation of the Air Defences of Great Britain in the past few years, of the peculiar problem of the defence of London.

Comparative Table of Values of Single-Seater and Two-Seater Aircraft.

Single-Seater Fighter.

(*a*) *Advantages.*

1. Superior speed.
2. Superior climb.
3. Superior manœuvrability.
4. Smaller and therefore cheaper to produce.
5. Require less manning.
6. Require less training of personnel.

(*b*) *Disadvantages.*

Only possess fire power in direct line of flight, *i.e.*:—

1. Cannot produce concentrated fire.
2. Cannot produce sustained fire.
3. Exposed to unreturned fire when breaking away.

Two-Seater Fighter.

(*a*) *Advantages.*

1. Capable of bringing superior fire power to bear.
2. Capable of a large proportion of all-round fire.

Very important factors.

3. Possibly interchangeable with bomber.

(*b*) *Disadvantages.*

1. Inferior climb.
2. Inferior speed.
3. Inferior manœuvrability.

Probably not serious disadvantages against enemy bombers.

4. Larger and therefore dearer to produce.
5. Require more manning.
6. Require more training of personnel.

AIR PHOTOGRAPHY

By Wing-Commander F. C. V. Laws, O.B.E., R.A.F.

I.—EARLY DEVELOPMENTS.

I PROPOSE to deal only with those aspects of Air Photography which are of historical interest, avoiding, as far as possible, anything of a purely technical nature. For convenience, the subject is dealt with under six headings:—

1. Air Photography before August, 1914.
2. Position at the Outbreak of War.
3. Provision and Training of Personnel.
4. Organization of Photographic Sections.
5. Equipment, Design, and Provision.
6. The Issue and Use of Air Photographs.

Air Photography Before August, 1914.

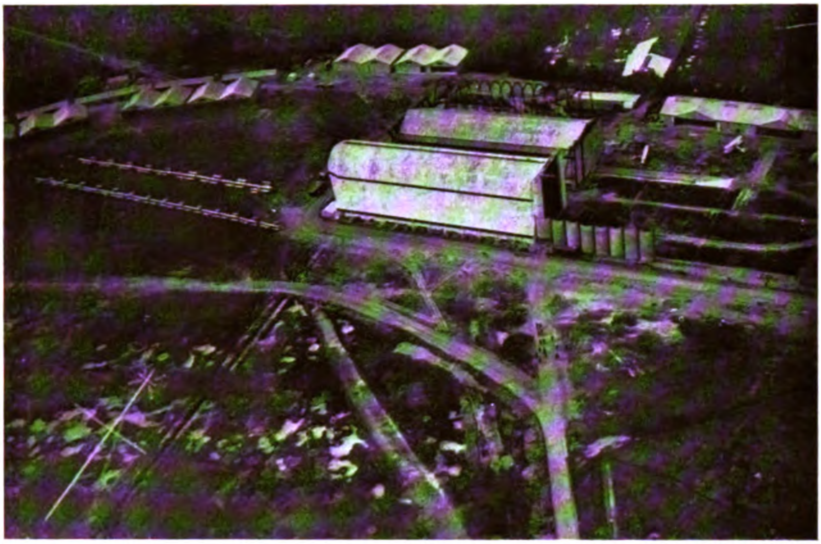
The Official History of the Royal Air Force, "War in the Air," Vols. I and II, makes no reference to Air Photography prior to September 15th, 1914. Such progress as was made before the outbreak of war in 1914 may, therefore, appear insignificant, but was in fact of the utmost importance. I refer to the period between the formation of the Royal Flying Corps in 1912 and the outbreak of war in 1914.

During this period a section of men, skilled in photography, were trained and also gained valuable experience—experience which was ultimately utilized to the fullest extent for providing the nucleus from which the R.F.C. photographic sections of the war sprang into existence, forming first the original section of 1st Wing in January, 1915, and ultimately sections for the newly formed Wings and for home establishments.

During the progress of this training, the experiments conducted, particularly in regard to the chemical aspect of air photography, *i.e.*, developing formulæ, etc., resulted in the production of the formula which, after some sixteen years, still exists as the standard throughout the Service for air negative development.

Special cameras for air work were not neglected. Early in 1913, the first air camera was designed (Fig. 1). The body (*a*) consisted of a wooden box packed with horse-hair into which the lens holder was embedded; the plate magazine (*b*) was a separate unit, capable of carrying twelve plates. The plates were arranged so that changing was automatically effected after making each exposure by moving the lever (*c*). The same movement operated the sector shutter.

Being the first camera specially designed for air work, it was also the first camera to be fixed vertically into an aeroplane for taking overlapping exposures. Fig. 2 is a copy of a fairly successful run. It is strange to relate that no attempt was made to work out the simple time



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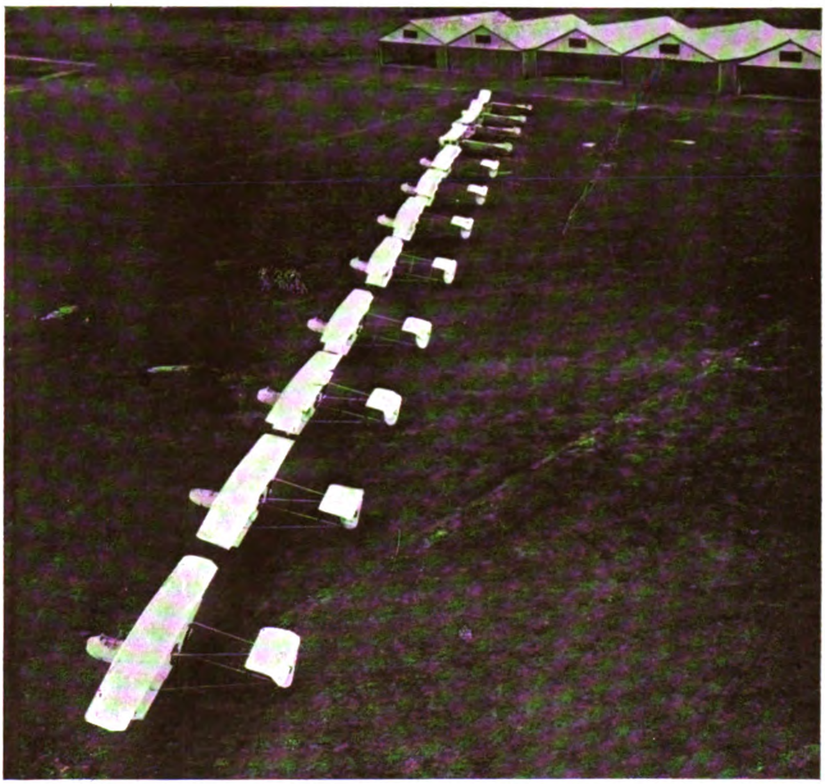
Oblique Air Photograph showing H.M. the King and Staff crossing Farnborough Aerodrome to inspect the R.F.C. aeroplanes lined up on Jersy Brow, May 19th, 1914.



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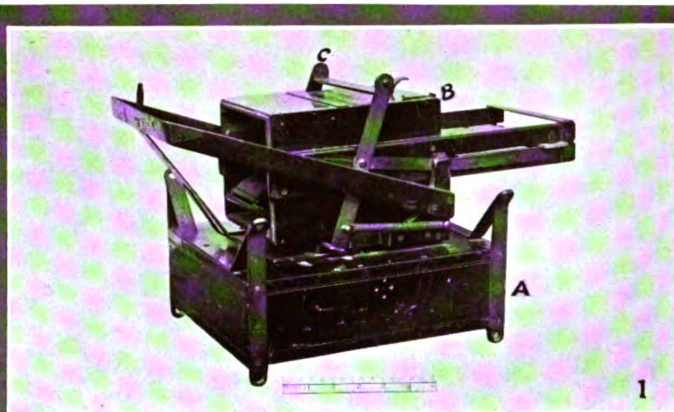
R.F.C. Aeroplanes photographed from the air, Farnborough, 1913.



1. **The first specially designed Air Camera used by the R.F.C., 1913-14.**
2. **An example of strip or overlapping photography taken during 1913 with the above camera.**
3. **An oblique photograph showing the aircraft of Nos. 2, 3 and 4 Squadrons, R.F.C., at the Concentration Camp at Netheravon, June, 1914.**

interval factor. That an overlap was secured was considered to be an excellent shot.

The experimental work with this camera was brought to an abrupt end by the crashing of the Henri Farman in which it was being conveyed to the Concentration Camp at Netheravon during June, 1914.

The following quotation from *Flight*, dated June 3rd, 1914, renders it abundantly clear that air photography was receiving a considerable amount of attention before the war:—

"As regards photography, which is also, in the case of visiting squadrons, attached to the Headquarters Flight, on each reconnaissance embodied in the scheme of training, an independent aeroplane has followed the aerial observers with a photographer as passenger, and the object which the machines taking part in the reconnaissance were required to locate has been photographed from a height of over 2,000 feet, so as to show any observers, who failed to discover the enemy, the exact position in which he was located at the time the observation was made. As previously mentioned, several of these photographs are reproduced in this issue through the courtesy of Col. F. H. Sykes, Commandant of the R.F.C., and Major Musgrave, while, in addition, a photograph taken from an aeroplane at a height of 6,700 feet also appears.

"In addition, photographs of the country in the immediate vicinity of the camp have been made, and it would appear to be probable that a photographic survey of the whole country from above would prove of inestimable value to pilots, despite the changes in appearance of the ground at different seasons of the year; because the prominent landmarks would appear in the photograph, exactly as they appear to the pilot. The cameras used in the R.F.C. for aerial photography differ in no way from the usual type, and are fitted with ordinary Goerz lenses." (Fig. 3.)

I do not propose to go into further details of this pre-war photography; the foregoing should make clear what had been accomplished prior to August, 1914.

Position at the Outbreak of War.

A review of the situation, as far as it relates to the photographic developments in the Royal Flying Corps, when the first three Squadrons left for France, will show that the trained photographers, numbering about nine other ranks, were distributed between the three Squadrons on mobilization.

These men had sufficient knowledge of the subject to ensure that under reasonably good weather conditions they could secure fairly good examples of oblique photographs.

They had also acquired sufficient data from which to give an accurate estimate of the required exposure under varying conditions of light, and were capable of producing prints in a reasonable time, consistent with the means at their disposal.

The equipment available was somewhat primitive, consisting of five Press-type cameras, a number of printing and developing boxes (Fig. 4), and a small quantity of plates, paper, and chemicals.

On the arrival of the Squadrons in France, so little interest was shown in photography that the photographers were otherwise employed: in some cases they were lent to Army units for other duties. One case

I remember of an N.C.O. who was sent with probably the first anti-aircraft section in the field, his duty being to give a decision as to the nationality of any aircraft before the guns were allowed to open fire.

Provision and Training of Personnel.

The first batch of men specially enlisted as photographers in 1915 were equipped and sent out to France without any special training. They were drawn chiefly from the Press photographers of Fleet Street, where the rapid production of prints was an essential part of their work. They were indeed exceptionally efficient at their trade and quickly proved their value in the field.

The supply was unfortunately very limited, and, as this source failed, it was necessary to make provision for training enlisted photographers in the essential details of air photography, particularly in rapid printing, shading, and drying.

During the summer of 1915 two Army huts were erected at South Farnborough and fitted up as darkrooms for use as a school for photographers and photographic officers.

As establishments increased, these huts became inadequate; the school was given the use of an unoccupied Sergeants' Mess in the Marlborough Lines Barracks, and ultimately specially constructed accommodation was provided near the R.F.C. Barracks. (The building is still the School of Photography.) It is believed that this was the only building of a permanent nature erected during the war. So great were the demands for more and more photographers that even this soon proved to be inadequate, and extensions were provided in (1) the London Polytechnic, the recently vacated German Waiters' Club in London, and (3) Goschen Buildings, Henrietta Street, Strand, and, finally, during 1918, an extension was added to the permanent School at Farnborough for the training of female photographers under the supervision of a W.R.A.F. officer.

The undermentioned extracts from the syllabus of training show to some extent the vast number of subjects taught in these schools:—

Syllabus of Training.

Details of mechanism of cameras.
Properties of focal plane shutter, and anastigmatic lenses.
Colour filters. Panchromatic plates.
Attachment of cameras to machines.
Care of cameras and lenses generally.
Simple repairs to cameras.
Jambs. How they occur and how they can be avoided.
Loading of magazines in complete darkness.
Formulæ in use.
How to obtain thin, quick printing negatives, full of detail.
Value of "colour."
Washing and drying of negatives—use of spirit—avoidance of spirit fog due to sunshine and change of temperature.
Printing—speed essential. Hand shading. Every man should be able to make at least fifty good prints an hour.
Drying—spirit and burning off process.
Reversed writing for marking negatives.
A sound idea of the shutter slits and exposures to be used.

Photographic Officers.—The provision of officers with sufficient technical knowledge was a difficult problem. The first batch of, say, twelve officers were selected from civilians who were photographers by profession.

This scheme was not entirely successful; far more suitable officers were those secured from either:

(*a*) Ex-pilots and observers who had been rendered unfit and subsequently trained;
(*b*) Selected men from the ranks.

Organization of Photographic Sections.

The organization of photographic sections in the field began with the formation of a section at Headquarters, 1st Wing, in January, 1915; prior to this there were one or two air mechanics of the trade of photographer in each Squadron. These men were collected at the Headquarters, 1st Wing, to form this original section. Other sections were subsequently formed at the 2nd and 3rd Wing Headquarters, but with the rapid growth of photography it was soon evident that these would have to be replaced by a section at each Squadron.

Before the end of 1915 this change had been effected, firstly by the formation of sections at Corps Squadron, and, later, a section at one Squadron per Army Wing. The establishment of personnel for these Squadron sections was in the first place one Corporal and three Airmen, but from time to time increased, and frequently augmented by men loaned from local Army units. These changes continued until June, 1918, when the final establishment was:—

For Army Wings (with one Squadron doing photography): 1 Sergeant, 1 Corporal, 24 Air Mechanics.

For each additional Squadron doing photography: 1 Corporal, 6 Air Mechanics.

For a Corps Reconnaissance, France: 1 Sergeant Mechanic, 1 Corporal Mechanic, 14 Air Mechanics.

Officers were allowed on the following scales:—

During 1915 one E.O.2 (T.) at each Wing Headquarters, subsequently amended to provide two photographic officers per Brigade (usually situated one at each Wing Headquarters). They were, however, both classed as Brigade officers, but stationed at Wing Headquarters for convenience.

Finally, in 1918, establishments provided the following scales:—

Headquarters, R.A.F., in the Field.—One Major i/c Photography, graded as Park Commander.

Headquarters, Brigades.—One Captain, graded E.O.1.

Corps Wings.—One Lieutenant, graded E.O.2.

Army Wings.—One Lieutenant, graded E.O.3.

The organization at home followed on the same lines as that in the field.

The School of Photography was placed under the direct control of the General Officer Commanding, Training Division, for all purposes, and its output was always absorbed into units within the Division. Reinforcements for overseas were drawn from these units and not from

the School. In this way photographers had always the added advantage of some practical experience in Squadrons before arriving in the field.

Equipment, Design, and Provision.

Of design and provision, the latter was by far the most difficult problem.

It is common knowledge that before the war Germany held practically a monopoly in photographic lenses and certain essential chemicals.

Paper base for bromide papers was also very largely supplied from foreign countries, I believe chiefly from Belgium, with the result that, after the outbreak of war, these sources of supply were very quickly closed.

I have stated elsewhere that little or no photography was done during the first months of the war; therefore, the photographic industry was not called upon for supplies until stocks had already been depleted of many of the essentials (the outcome, of course, of that famous war cry, "Business as usual").

Once the die was cast and it was recognized that photography would play an important part in the conduct of operations, demands upon the photographic industry, far in excess of anything previously known, were made.

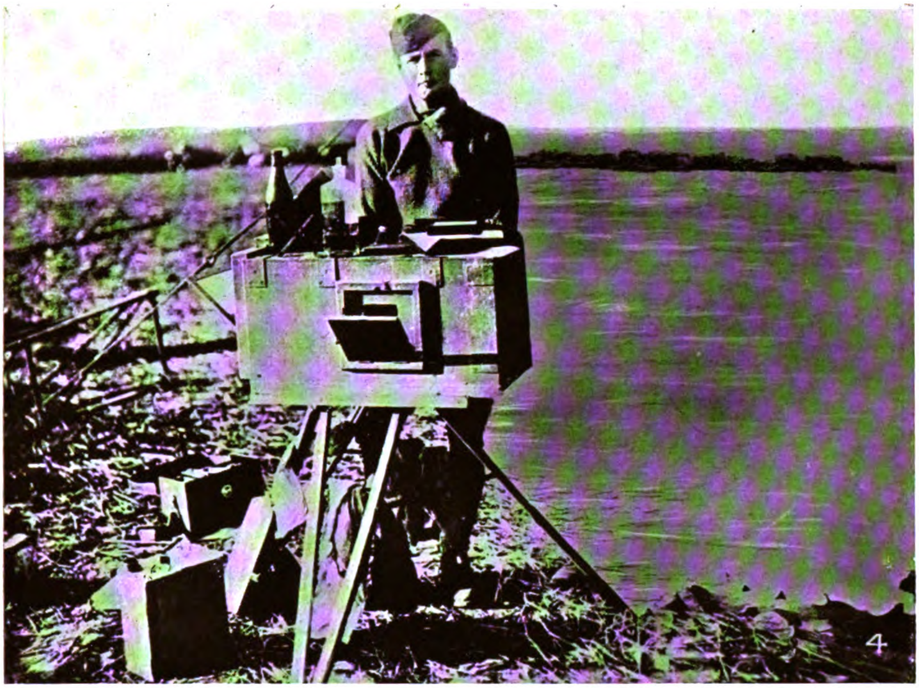
Lenses. The most important article of photographic equipment was the special type of lenses required, and the supply of these was an achievement worthy of special attention.

In 1916 the manufacture of optical glass in Great Britain for high-class photographic lenses was negligible. We relied almost entirely on the French for supplies of raw glass, and the amount available from this source was totally inadequate. Pressure was therefore brought to bear on the optical branch of the Ministry of Munitions, who were asked, firstly, to requisition all the lenses in England from the public (*i.e.*, those suitable for R.F.C. purposes), and, secondly, to push on with the experiments for the production of glass in England in order to secure our requirements for lenses.

The compulsory return of lenses from the public and professional photographers, coupled with the small quantity of French glass, gave a sufficient supply until the spring of 1918, when the manufacture of optical glass in England became an accomplished fact.

The collaboration between the lens manufacturers and the R.F.C. resulted in the production of lenses equal, if not superior, to any produced by either our allies or enemies (Fig. 5). So rapid was the output that we were soon in a position materially to assist our allies as well as satisfy our own requirements.

Plates, Paper, and Chemicals. The use of colour sensitive plates had to some extent been developed by the R.F.C. in 1914, and after many trials the orthochromatic, or yellow sensitive, plate was adopted as standard. Later events proved, however, that the preference given over the panchromatic type of plate (*i.e.*, sensitive to all colours) was due only to the increased speed obtainable in the former. It was during 1917, as a result of research in this country, a panchromatic plate with a speed of H. & D. 450 was produced; this compared with approximately H. & D. 150 before the war. This was a great advantage, for the increased speed provided a margin which permitted the use of



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4a. The Field Developing and Printing Box.

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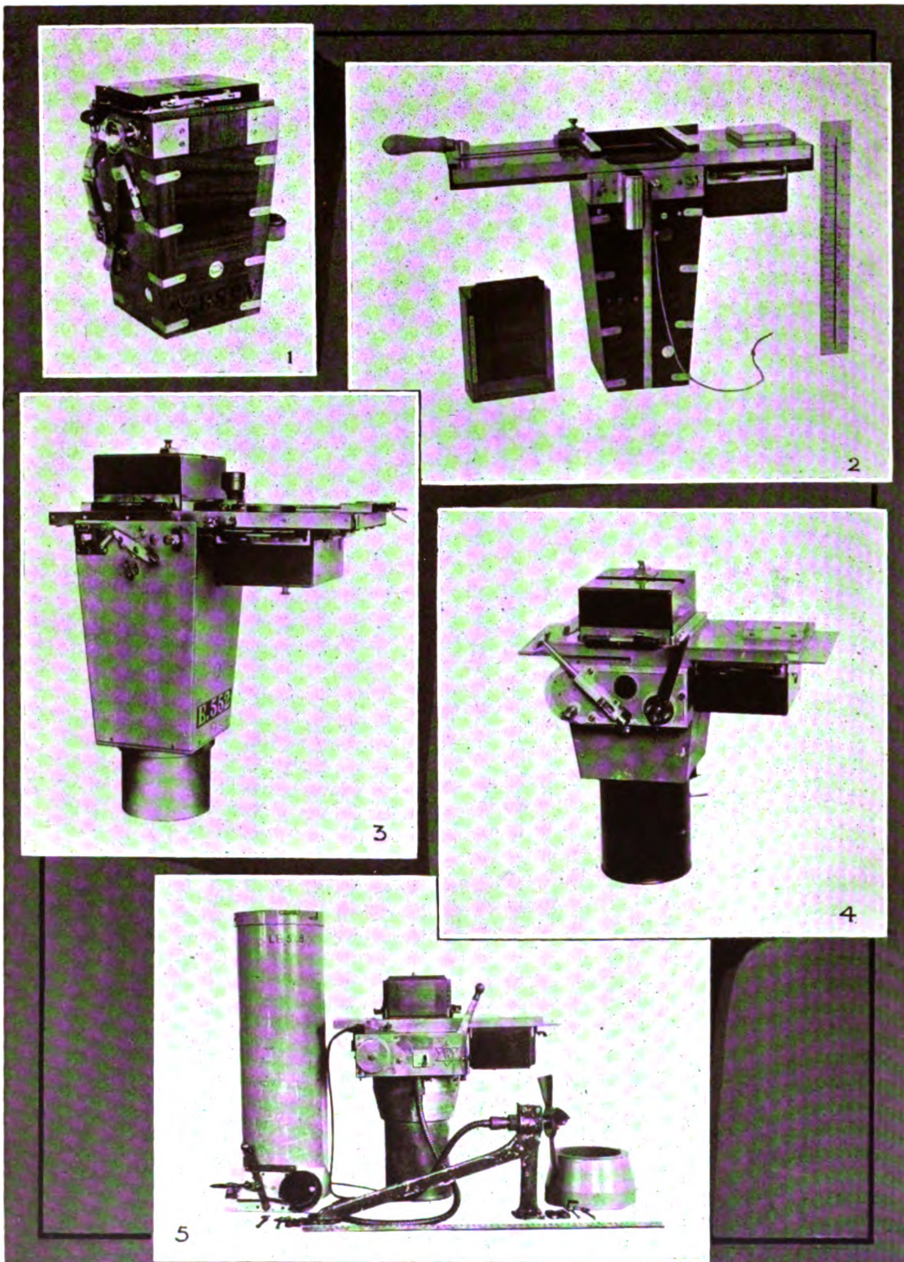
5a. A batch of Lenses ranging from 4 inches to 47 inches focal length, used for air photography during the war.



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Air Cameras.

1, A Type. 2, C Type. 3, E Type. 4, L Type. 5, LB Type, showing separate lens holders and windmill drive.

suitable light filters. The supply of these panchromatic plates reached the enormous figure of nearly four millions.

The production of bromide papers presented no technical difficulties, but the enormous quantities necessitated the building of new factories and machinery. The provision of the base was, I believe, a frequent cause for grave anxiety, as also was its Baryta coating, which was almost a new industry for British sensitized paper makers. It has been estimated that no less than forty million sheets of sensitized paper, representing nearly 300 tons in weight, were supplied to the forces during the years 1914 to 1918.

The two chemicals most essential for the development of plates and paper, viz., metol and amidol, were not normally manufactured in Great Britain, but when outside supplies ceased, supplies were very quickly forthcoming from home markets. Some idea of the magnitude of the task of producing these chemicals may be gathered from the comparison between 1915, when only a few thousand ounces of developers and one or two tons of hypo were used, and 1918 when nearly six tons of developers and some 220 tons of hypo were used.

Now let us turn to design. As in all other branches of the Service, it is seen that the demand or necessity was the greatest creative force, and it is easy to see that the evolution of air cameras, from the first primitive hand-camera to the semi-automatic and remotely controlled camera of 1918, closely followed the dictates of the ever-increasing demands for air photographs.

In dealing with the products of the war, I shall describe them in the order in which they were designed. Starting with the "A" Type, which was fitted with a slide to carry single plates 5 in. by 4 in. in size, the lenses were of 8-inch focal length. Straps were fixed to the side of the camera for the observer to grip as he leant over the side of the machine to take the photographs. Later, however, in an attempt to secure verticality, it was attached to the outside of the aircraft by means of leather straps and a wooden frame.

To meet the ever-increasing demands for photographs, in the summer of 1915 a changing box was fitted to this camera, which then became known as the "C" Type. This provided a useful step forward at that time.

The general principle of this reconstructed camera was that it carried magazines, one full of plates and the other empty. The one containing the plates was placed in position above the focal-plane aperture, so that, when the lid was withdrawn, the plates fell into position to await exposure, which was made by the pilot or observer as the aircraft travelled over the objective. (The first overlapping strips of photographs of the opposing trenches were taken with this camera.)

After each exposure, the exposed plate was pushed along by means of a handle on top of the changer until opposite the receiving magazine, attached in an inverted position beneath the changer table. This operation also reset the focal-plane shutter.

The bulkiness of the "C" Type and the many difficulties experienced from the shrinkage and warping of the wood due to atmospheric conditions, throwing the lens out of focus, led to the design of the "E" Type (autumn, 1916).

The material change in design from its predecessor, *i.e.*, having half of the changer top cut away, necessitated the introduction of a capping

shutter to cover the focal-plane shutter during the resetting operation, also a somewhat difficult method of transferring the plate after exposure to the receiving magazine. Another new and useful device was an adjustable lens tube; on this lenses varying from 8-inch to 10½-inch focus could be fitted, and it also provided means for adjusting the focus.

The demands for air photographs immediately before and during the Somme Battle became so enormous that the desire for more automatic control of the camera resulted in the design of a semi-automatic camera known as the " L " Type, but it was early in 1917 before it made its appearance in the field. This type was a great advance on its predecessors in every respect.

The whole of this camera was of metal construction, with the exception of the magazines, which were of wood. The changing, etc., could be operated either by hand or automatically at will, a wind-driven four-bladed propeller placed in the slip stream and attached to the fuselage provided the power for driving the changing gear.

The principal advantages of the automatic action were that, when taking a series of photographs, the only function of the operator was to make the exposure, the whole of the changing and resetting device working by means of the propeller.

With an air speed of 50 m.p.h. the cycle of operations for changing the plates and resetting the shutter was performed in 10 seconds. This time was changed in direct proportion to the air speed.

At the time the " L " Type came into existence it became apparent that the practice of controlling the scale by the height at which the exposure was made was unsound, if not impossible. The obvious method was to provide means for lenses of suitable focal length provided with a simple device for attachment to cameras. The scale of photographs could then be controlled when working under varying conditions of height, etc.

This provision was met by converting the " L " to the " L.B." Type, by adding adaptors for mounting lenses of 4-inch, 6-inch, 8-inch, 10-inch, 12-inch and 20-inch focal length. Advantage of this change was also taken to simplify the mechanism, the chief alteration being the embodiment of a removable self-capping focal-plane shutter with an exterior lever for adjusting the shutter slit, thereby providing accessible means for adjusting exposure in the air, also an instantaneous method of converting the change-over mechanism from hand to power. This camera, renamed the " P.7," is still in general use.

It was becoming evident during 1917 that, at the increased height from which photographs were being taken, the enlarged prints from a 5 in. by 4 in. negative were becoming more and more unsatisfactory (*an important factor to keep to the fore in future design*).

The B.M. camera was designed to overcome this difficulty by means of a plate of 8½ in. by 6½ in. and a 20-inch lens. The size of the plate was again changed, to 18 by 24 cms., after the manufacture of the first few models, this being the size standardized by an Inter-Allied Photographic Conference.

Some excellent results were obtained with this type of camera, but it was doomed to unpopularity by its prohibitive weight.

The Aero-Cam, " F " Type, was the first and only official film camera used by the R.F.C. or R.N.A.S. during the war. It appeared in 1916 and was soon rejected by the R.F.C. experts in France, but did some reasonably good work in the East.

It was designed to take a continuous series of pictures on a roll of film 5 inches wide, in 25-foot and 50-foot lengths, a 50-foot roll providing sufficient for a series of 120 exposures.

In appearance it was like a wooden box, approximately 14 in. by 7 in. in size. On top was mounted a 6-inch cone to which was attached a four-bladed propeller providing the power for driving the camera mechanism. There were two lenses, one of F=8-inch, the other F=1-inch, the former being the normal objective, and the F=1-inch, mounted in a position so as to project the image of a special aneroid and thus providing on each exposure a record of the height at which the exposure was made.

The "B" Type camera, the predecessor of the "B.M.," was a 1/1-plate camera with a 20-inch lens. It was designed in France in 1916, and was manufactured only at Repair Depots in the field. Very few lenses of 20-inch focal length were available at that time, most of these being taken from cameras on captured German aircraft. The camera was of the simplest kind, consisting of a round aluminium cone containing a 20-inch lens at one end, and to the other end was attached a self-capping focal-plane shutter. The plates used were carried in double dark slides. Some very excellent examples of oblique photographs were secured using this camera mounted in the front of the F.E.

With the passing of the "A" Type camera, a replacement was required for the hand-held camera for oblique work. The "P" and "Type 18" came into general use for this purpose, the former in the R.F.C., the latter in the R.N.A.S. There is little in such simple cameras to describe; they were of fixed focus, and fitted with focal-plane shutters, the only material difference between them being the focal lengths of the lenses, the "P" being equipped with F=10-inch and the "Type 18" with F=6-inch.

With the exception of a certain number of non-standard models, the foregoing represents the war's products in air cameras.

Mounting or Installation of Cameras. Simultaneously with the development of air cameras it was necessary to evolve methods for mounting them into all types of aircraft.

The first mountings were fixed to the outside of the fuselage, and later to the inside, usually in rear of the observer's seat.

There were many types evolved, all with the object of damping out the adverse effects of vibration of the aircraft. The definition of air photographs suffers to a far greater extent from vibration than by ordinary movement, *i.e.*, movement over and above the objective to be photographed.

The initial attempts to absorb these vibrations were made by supporting the cameras on various forms of rubber sponge.

The most effective shock-absorbing device embodied a principle which had been tried and rejected by the French. The camera was suspended on an adjustable framework attached to a pair of bell-crank levers and supported by two springs; the tension of these springs could be adjusted to compensate for the weight of different types of cameras.

It was claimed for this mounting that all vibrations were converted to a vertical movement which would not seriously affect the definition of the photograph. (Control of the camera for fore-and-aft level, and means for rotation to correct for drift were also provided in this model.) It was known generally as the Universal Camera Spring Mounting.

At the close of hostilities, experiments were still in progress with the object of producing a mounting much reduced in size and weight, which would combine with the shock-absorbing qualities to increase camera control, which was particularly necessary when photographing for mapping purposes.

Darkroom Accommodation. With the exception of the printing box already referred to (a most inefficient article of equipment), nothing was available for the accommodation of photographic sections; improvised darkrooms were therefore secured in billets, etc. It is safe to say that rooms of every description, from the cellar to the roof, were used for this purpose. I can well remember one of the first sections being accommodated in a cellar immediately below the dining-room of the Wing Headquarters Mess. They were using an acetylene generator borrowed from a lorry as the illuminant for the enlarging lantern, causing a foul smell in the dining-room from leaking gas pipes and soaked carbide. This frequently incurred the displeasure of the distinguished gathering above, and no doubt made for unpopularity, but undoubtedly accelerated the provision of more suitable gas generators.

Darkrooms were subsequently provided in lorries and trailers. In these it was possible to carry on after a move until more adequate accommodation was properly organized. These lorries were equipped with portable generating sets which provided light for the section and illuminant for the enlarging lantern. The use of these lorries was, however, strictly limited; it was never possible to do more than a very small percentage of a Squadron's normal output in them.

Late in 1918 trailers for attachment to the lorries were provided capable of carrying a portable hut to augment the accommodation in the lorry.

The Issue and Use of Air Photographs.

Distribution of Air Photographs. There was no specified number of copies per negative laid down, numbers varied according to Armies or Corps for whom a particular unit was working.

The numbers varied from seven to thirty-six per negative, and were usually delivered by Squadrons to:—

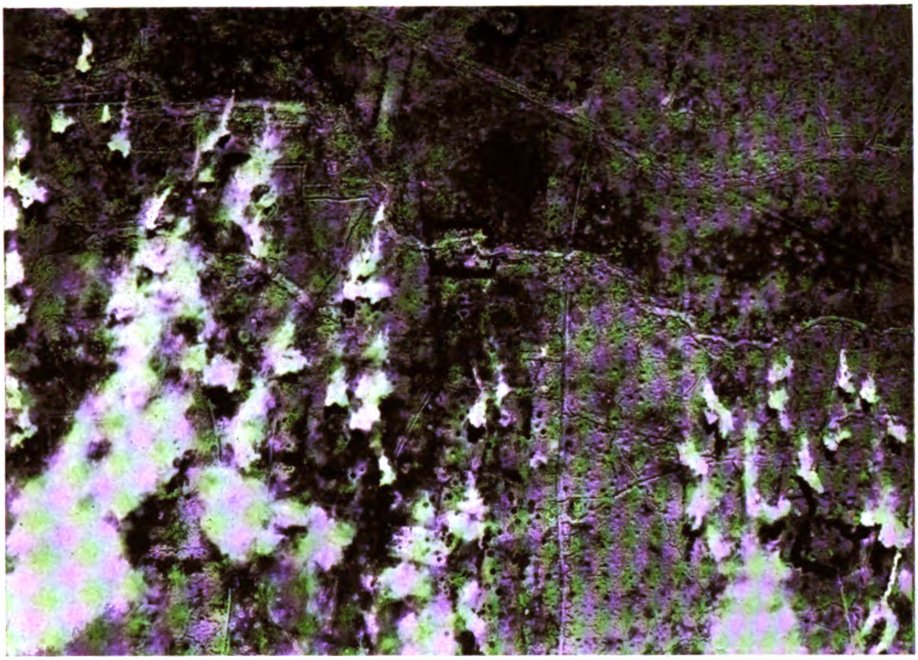
Intelligence, Army Headquarters (responsible for redistribution to lower formations).
Corps Wing Headquarters.
R.F.C. Brigade Headquarters.

Copies of photographs of special interest from a technical or operational point of view were sent to R.F.C. Headquarters direct from Squadrons.

Reordering from old negatives was done through the same channels as for new photographs. When reorders exceeded 100 copies from any one negative, a duplicate negative was made and the orders could, at the discretion of the B.I.O. or O.C. Squadron, be passed through R.F.C. Brigade to the Director, Army Printing and Stationery Services, for completion and subsequent delivery to Army formations.

Uses of Air Photographs. Air photographs were employed for various purposes in connection with reconnaissance and mapping.

A study of these photographs revealed information with regard to centres of activity, ammunition and supply dumps, telephone lines,



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Vertical Air Photograph, when it was *not* quiet on the Western Front.

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Oblique Air Photograph—Ypres, 1919.

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1914-18.

1. Dismantling a B.E.2C. forced down behind our lines near Pozieres.
2. An R.E.8 after a forced landing beside a road near Boesinghe.
3. Silhouette of a 13-pdr., 9 cwt., anti-aircraft gun in action at St. Jean.
4. An R.E.8 of 52 Squadron R.F.C. about to start out from Bray Dune; aerodrome.

frequently used roads and tracks, and also other details bearing on the enemy's organization. They are of fundamental importance for mapping in war, and their use for this purpose is too well known to require further explanation.

Trenches. In addition to providing data for the production of trench maps, a good deal of other useful information could be deduced from photographs, in particular, information as to their depth and nature, the position of ammunition stores, etc.

It is also of interest to note that air photographs also afforded the only reliable means of mapping our own trenches; it was therefore found necessary to photograph our own lines as well as those of the enemy.

It may be said that the air photograph was used as a graphical record of a reconnaissance, always providing data which could be used by the General Staff to keep the tactical situation in view.

The importance attached to this work by the General Staff may be assessed from the following report which was written on November 18th, 1918:—

"It is interesting to note that during the past 10½ months photographic work has been in greater demand than ever before, in spite of the fact that for the greater portion of that period the war has developed into one of movement.

"The figures are tabulated from the date that records exist, viz., August, 1916, to December, 1917, and January, 1918, to 11th November, 1918. The increase during the latter period on the monthly average of negatives is (approximately) 160 per cent. and in prints (approximately) 130 per cent.

	Negatives.	R.A.F. Prints.	Total Prints with D.A.P. and S.S.
"From Aug., 1916, to Dec., 1917 (17 months)	133,082	3,287,338	4,368,269
Average per month	7,828	193,373	256,957
From Jan., 1918, to 11th Nov., 1918 (10½ months)	215,286	4,840,877	5,676,101
Average per month	20,504	461,032	540,581

Increase in Negatives (approximately) 160 per cent.
Increase in Prints (approximately), 130 per cent.

"This increased work has been carried out under much more difficult conditions than at any previous period.

"Owing to the retreat in March and the continuous movement from that time onwards, accommodation was at times very difficult.

"The actual taking of the photographs with suitable lenses for the different classes of work done was made possible by the standardisation of cameras which enabled us to fit lenses of any focal length.

"The technical quality of the photographs has been levelled up in all Brigades by the standardisation of camera fittings and Spring Mounting.

"The increase in the establishment of personnel during the early part of the summer enabled us at all times to meet demands for the enormous number of prints required.

"H.Q., R.A.F.,
"18th November, 1918."

[*Part II, which will be published in the October number of this Quarterly, deals with post-war developments.*]

EQUITATION AS AN AID TO EFFICIENCY IN THE ROYAL AIR FORCE

By Wing-Commander A. W. H. James, M.C., R.A.F. (Retd.).

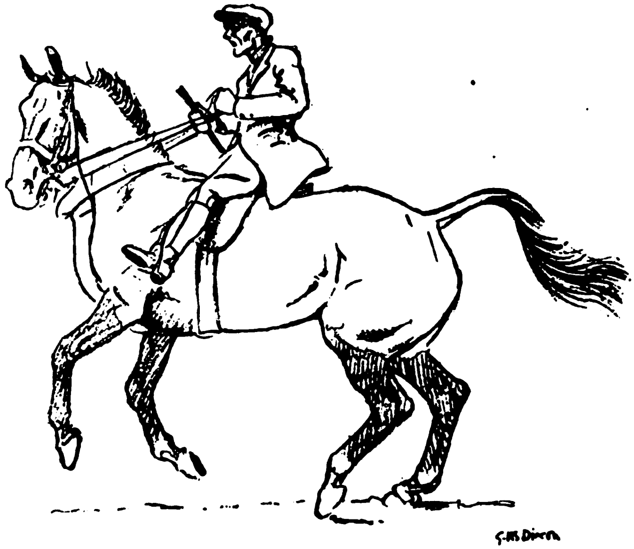
One of the worst of the rather numerous troubles from which this country is suffering at the present time is the expert. An expert is a person who gives advice. If his opinions were really valuable he would, of course, keep them to himself and make a competence by exploiting them. But by so doing he would become a commercial success, and would thereby be disqualified from being an expert. Experts, like any other species of animal, have their characteristics and their favourite habitat. Lions like dry, open country; tigers prefer thick cover and water. Experts flourish particularly in Government offices; and the most favourable environment of all to them is the educational one. In no other single field can so many experts be employed in inspecting so many other experts, and no other field yields so much of their favourite food, curricula.

Of course, we all know in our heart of hearts that nearly all education is a waste of time and money. In fact, if experts can educate people sufficiently, they can make them almost entirely useless. Conversely, if youth can avoid all but the elements of education, and steer absolutely clear of experts in upbringing, it may rise to the top of the tree. Subsequently, while acquiring a competence, a person can, if he wants to, easily absorb all the culture necessary for enjoyment of the best things in life. Science and commerce illustrate this continually. The most eminent philologist that Oxford has produced, who died during the past winter, only taught himself to read when he was sixteen. Lord Inchcape started in business at fourteen, Mr. Victor Emanuel at twelve.

All this may sound rather irrelevant to the subject of equitation as an aid to efficiency in the Royal Air Force. But it is not really. After spending the greater part of the late war with the Royal Flying Corps in France, the writer was impressed with how often ability to obtain the nearest horse, get on to it, and use it, was valuable. So that when, after the war, it fell to his lot in conjunction with the now Editor of this journal to work out the first curriculum for the Cadets at Cranwell, he tried hard to get instruction in riding included in the scheme of work. The educational experts were, of course, horrified. None of them knew what a horse was; few of them knew what an aeroplane was; and some of them did not know what a war was.

It was proved conclusively that, unless a Cadet was given, per week, twelve hours' musketry and armament instruction, eighteen hours' chemistry and physics, six hours' P.T., eight hours' English and composition, eighteen hours' workshops, six hours' drill, twelve hours' flying, six hours' mathematics, six hours' organized games and boxing, and twenty-four hours in various other branches of learning that I have forgotten, not omitting church parade on Sunday, he could not possibly be made mentally, physically, or morally fit to fly an aeroplane in war.

So, of course, the educational experts had their way, and we started to train for a purely mechanical war, to be fought in a civilized country with good roads and a perfect telephone system. (Roads and telephones are highly susceptible to expert inspection, as we know to our cost.) Still holding unrepentantly to the belief that it would be a very good thing if every Service pilot was taught something about riding, let me state the case for it. Firstly, take riding as an aid to flying itself. The essence of good flying is good " hands," that is the perfect correlation of brain, eye and muscle on the controls. Sufficient practice in flying itself will, of course, in time produce the necessary almost automatic nervous co-ordination. Probably, driving high-powered motor-cars, or yacht-sailing will do so, too. But the cheapest and safest way to learn

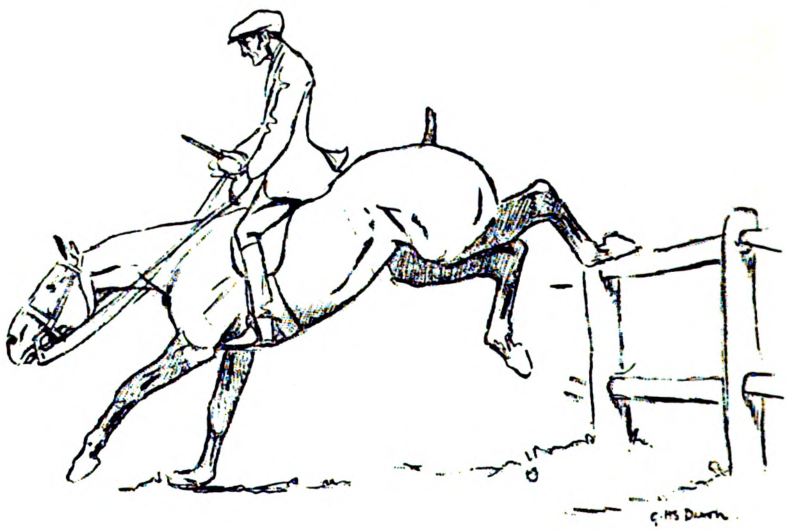


BAD HANDS

" hands " is on a horse. The action of the hands in riding and in flying is extraordinarily similar. Anyone who has given dual to a pupil who rides well knows how much easier he is to teach than the average pupil. I remember Gordon Bell, I suppose the most brilliant flyer among pre-war pilots, remarking this to me at the Central Flying School, Upavon, in 1916, when we were both instructors. Possibly, though, the point was more obvious in the smaller-engined and lighter aircraft of that time than it is to-day. A great merit of riding is that it quickens the brain in exactly the direction required for flying. In riding, as in flying, but as opposed to motoring and sailing, the conveyance can be left to itself for considerable periods, while the brain and eye are concentrated ahead, yet at the same time perfect balance and control must be maintained. In riding across country, following hounds, quick decisions and chances have to be taken, and manœuvres executed, closely comparable to making a forced landing, and quite the best possible training for such an event. A fall from a horse is, as a

classic character remarked, " a hawful thing." But it is cheap, nearly always harmless, and has a curiously *morale*-raising effect. If you watch a novice, one who is reasonably secure in the plate, but inexperienced, riding a horse, and the horse stumbles, shies, or " plays up," you will see that the first instinctive movement is to *snatch* at the reins. This snatch—a first-rate aid to further trouble, and one that has crashed innumerable aircraft—is partly a voluntary nervous action, partly an involuntary reflex action. (I do not know if these are correct medical definitions of voluntary and reflex, but perhaps the meaning is clear.)

I feel sure that, if we could have persuaded the experts and the Treasury to have allowed us at Cranwell an establishment of one horse per three Cadets and a good Warrant Officer instructor, the country



GOOD HANDS

would have been saved thousands of pounds in the long run. Instead, every Cadet was provided with a motor-bike, in order, it was said, that he might learn the elementary principles of the internal-combustion engine. But this everyone nowadays absorbs almost with their mother's milk, apart from the fact that engine training is anyhow learned by every Cadet in the ordinary course of work and play.

A second use of riding to the Service pilot, and especially of its most attractive form, hunting, is in learning to judge ground surface, and what is termed " an eye for a country." Equally, in this case, a knowledge of farming would be nearly as good. But few pilots in these days of urbanization are likely to learn about farming, while anyone who goes out hunting, and uses ordinary intelligence and powers of observation while so doing, quickly acquires the knowledge referred to.

This was very strikingly illustrated in April, 1918. At this distance of time it is probably not indiscreet to tell the story, and anyhow most of the persons directly concerned have by now retired. When the Fifth Army was driven back by the German attack on March 21st, it became necessary

to withdraw the R.A.F. squadrons behind that Army front. For the first few days this was not too difficult, because there were available many aerodromes and landing grounds that we had used during the Somme Battle in 1916 and later during the advance to the Hindenburg Line. But soon further retreat became necessary, and it was found that entirely new aerodromes must be selected at once. No provision had been made for this contingency. To find aerodromes in an arable country in April, that is when almost the whole of the spring ploughing and cultivation had been completed, was a bit of a facer. It happened that at this moment the writer was temporarily attached to H.Q., R.A.F., at St. André au Bois, and was detailed for this task by Sir Philip Game. About midnight each night, when the day's situation reports were all in, Sir Philip used to send for me, make a circle on the map and say, for example, "Two Corps Squadrons and three Army Squadrons must be moved into this area to-morrow evening," on whatever number and time the situation demanded. To the area indicated I drove in the dark, and started work as soon as daylight permitted. Standing on the front seat of the old Crossley tourer, holding on to the top of the windscreen with one hand, and the map in the other, I was driven along the roads at about 20 miles an hour. Faster, when past obviously impossible ground, slower past likely ground. The places selected had to have road frontage, both for access and because the squadron transport had to park on the side of the road. It was in the selection of suitable ground that hunting experience was quite invaluable. No second survey was possible, and a mistake would involve damage to aircraft at a time when repairs were almost impossible. Nor could any work be done on the landing ground chosen before the aircraft arrived. On most of the land only two surfaces were possible: either grass pasture or *second-year* "seeds." In a few places, on higher, drier land, I was forced to fall back on well-rolled winter wheat, only possible so long as no rain came. Pastures, in that district, were usually too small and too near to trees and villages. Having spotted a likely piece of ground from the car, it was necessary to get out, and, if the area and approaches proved to be all right, to examine the whole surface. This was most important, because, in a chalk country, the surface might anywhere have one of those circular depressions from which in olden days chalk was dug out for "marling" the land. It is astonishing how long it takes, and how exhausting it is when working against time, to walk over from ten to twenty-five acres sufficiently thoroughly to be certain that the surface is free from snags. I found that it nearly always paid to go to the nearest farm or troops, borrow or beg a horse, and return with it. The larger area that could be viewed in detail from the elevation of the saddle, and the extra speed at which that area could be covered, was astonishing. Without the aid of horses I doubt if it would have been possible to have done the job in the time available. And some funny animals I rode during that fortnight! They ranged from farm horses and Army draught to Sir Douglas Haig's spare charger, borrowed to survey an excellent piece of ground opposite the front gate of his chateau near Montreuil. To show how rapidly the selected landing grounds had to be utilized, when pressure to retire squadrons was at its greatest, I used to put priority calls through to Sir Philip Game from the nearest signals, give the map reference to the selected grounds, and upon this alone the squadrons had to be moved.

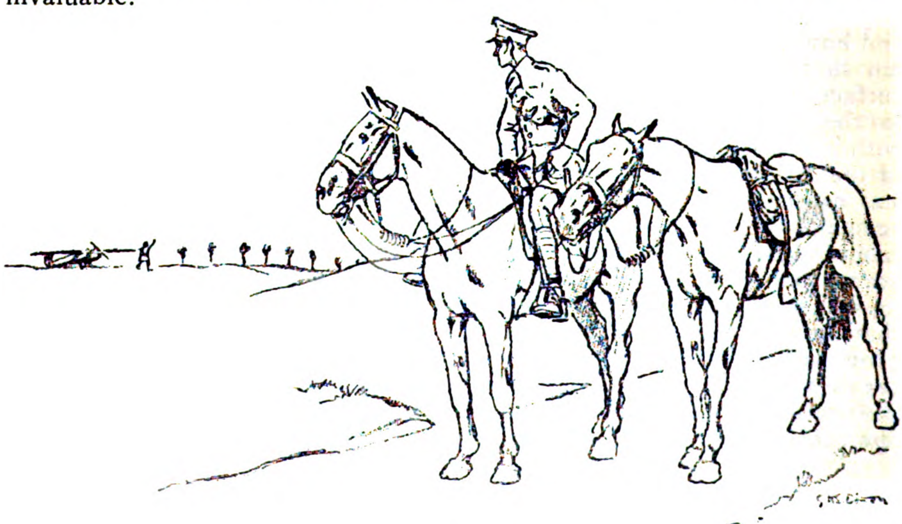
The summary of that exhausting fortnight's aerodrome hunting was that, thanks solely to the assistance of riding to help out with the surveys, and thanks to knowledge of land and country derived from pre-war pleasure on horses, the work was accomplished in the time, and not a single aircraft was lost from defective surface.

The R.A.F. at home is extraordinarily lucky in the number of stations from which first-rate hunting is obtainable. Cranwell, Grantham, Stamford, and Bicester, to name but a few, are splendid centres. Abroad, where it is cheaper than at home, polo makes a good substitute for hunting. Admittedly the finest game in the world, the possession of two or three ponies will turn a station like Risalpur, for example, from being desperately dull to being one that is enjoyable. In Iraq and in India the cost of polo is reasonable the season long, and the benefit to health, and hence efficiency, enormous. Entertaining and short drinks may have to be cut down, and the club bill reduced; but the liver and the pocket will be none the worse for that.

On several occasions, both during the war and later in India, I found riding useful in getting to and from forced landings and crashes. For many years to come, in the East especially, it is certain that the airman who can take to the saddle when occasion arises will be at a great advantage with the man who cannot do so. I remember Group-Captain Blank's large nautical posterior bearing sufficient evidence of this, after a long survey trip up a pass in India!

Which raises the question of Army Co-operation. Even in these times of mechanization, the horse remains on the strength of infantry, artillery and converted cavalry. In Army Co-operation many occasions will be found when ability to ride ranges from being merely useful to being quite essential. Anyone who has been a ground liaison officer knows this. On the Somme in 1916, when working with cavalry divisions, we even had to find wireless operators who could ride, and to make up W./T. saddle-pack sets.

Because human nature changes but little, history repeats itself. So long as ground forces are employed in war, and so long as aircraft co-operate with them, so long will the pilot find, on occasions, rare perhaps but pressing when they arrive, knowledge of how to use a horse invaluable.



WEATHER AS A FACTOR IN HISTORY*

By D. Brunt, M.A.

I might justify my choice of subject by quoting the words of Saint Beuve: "History seen from a distance undergoes a strange metamorphosis, it produces the illusion—most dangerous of all—that it is rational. The perversities, the follies, the ambitions, the thousand queer accidents which compose it, all these disappear. Every accident becomes a necessity. . . . Such history is far too logical to be true."

To put his in the language of hydrodynamics, history seen from a distance simulates "stream-line motion." A near view shows it to be turbulent motion, and I may best describe my present purpose as an effort to trace some of the eddies of history in the act of forming.

The Influence of Changes of Climate.

I have restricted myself, for the greater part, to considering weather rather than climate. I do this with regret, since the great changes in climate have had far-reaching effects upon human history. To cite an example, the only races which survived the last Ice Age (say, 40000 to 18000 B.C.) were those of *Homo Sapiens*, modern man, the Neanderthal (Monsterian) man, who closely resembled modern man, having failed to survive this glacial period. Going farther back to the preceding or Riss glacial period (say, 130000 to 100000 B.C.), we find that the Piltdown man who flourished in the inter-glacial period before this, failed to survive, though the Heidelberg man somehow contrived to do so. Many writers have surmised that man first originated in Central Asia, then a well-watered plain covered with forests, but which later, as a result of the slow elevation of the Himalayas, became arid, the forest land giving place to steppe. Only the most adaptable races could survive these changes, and it is possible that such changes were among the main factors which led to the evolution of man. But this is at best only conjecture, however alluring it may be.

Man is influenced by the weather in peace and war, his food and clothing being affected by the severity or mildness of the weather. Even his religion may be in part formed by climate. Sir Henry Lyons, in a paper in the *Quarterly Journal*, Royal Meteorological Society, 1910 (Vol. 36, p. 235), points out that the perfect preservation of human bodies buried in the hot, dry sand was well known to the Egyptians of pre-dynastic times (*circa.* 4000 B.C.). He states that it is highly probable that their religious beliefs early became imbued with the idea that such preservation was desirable, and even essential to the attainment of immortality. But when with the development of civilization the influential families began to construct large rock tombs to take the place of graves dug in the dry, sandy soil, they found that the bodies of the dead were no longer naturally preserved, as had formerly been the case,

* This Paper is based on a Lecture delivered before the Institution of Professional Civil Servants, March 28th, 1930.

and they had to resort to artificial means of preservation, thus giving rise to the elaborate procedure of embalming.

There was a period of maximum rainfall in Europe and Asia from about 2000 B.C. to A.D. 500, and during this period the races of the Mediterranean attained a level whose highest development was shown in the heroic age of Greece. Their downfall was accelerated by the westward movement of races driven from Central Asia by its increasing aridity. We may note in passing that the races of Central Asia have always been vigorous and war-like, since their constant migrations in search of pasturage for their horses led to perpetual conflict among different tribes. Their expansion southward being impossible on account of the lofty barrier of Tibet, they have always tended to expand laterally, through Turkestan and Southern Russia, and it was the pressure which they exerted on the peoples to the west of them which produced the barbarian invasions which overran Europe and overthrew the Roman Empire. The vigour of the Mongol races is readily realized when we contemplate the Mongolian Empire of the early thirteenth century under Jenghiz Khan—an Empire compared with which the Empires of Rome and of Alexander appear almost insignificant—extending from Korea to the Persian Gulf.

The increasing aridity of Asia during the past 2,000 years is borne out by the discovery of ruined cities in regions now desert-like in Arabia and Central Asia. Evidences of vanished civilizations are also to be found in the desert of Arizona and elsewhere in America.

The Influence of Weather in Peace.

But leaving the effects of climate, we find that the variability of weather affects man in times of peace, by its effects on food, health and property. Severe weather in winter or spring, or wet summers, may destroy his supply of food, and severe cold may kill him. In the earliest records of English history, the Anglo-Saxon Chronicle and Holinshed's Chronicle, we find numerous records of severe weather killing crops and fruits, and famine succeeding. In general it is difficult to trace any direct effect of these calamities on history, though there must inevitably have been such effects, particularly in the early periods when transport was rudimentary or non-existent, and each part of the country lived mainly on the produce of its own soil. According to Holinshed, the winter of 1407-8 was so severe in England that most of the small birds perished. Frost and snow lasted in England from December to March, and on the Continent the conditions were scarcely less severe. This was reputed to have been the severest winter for over five centuries. But no history book to which I have had access discusses the economic effects of this calamitous winter. In dipping into Holinshed's Chronicles I came across a reference to the winter of 1436, which was so severe that ale and wine were sold solid by weight, being afterwards melted down by the fire. It is definitely recorded that the famine of 1437-38 which followed was very severe.

Again, 1709 was one of the most severe winters on record. This winter was severe from Stockholm and Riga to Naples and Cadiz. The swiftest rivers of France, even in the South, were frozen, but there was little snow on the ground. Many of the great chestnut forests of Northern France and the orange and olive trees of Provence, were

killed by the frost, and the vine was completely destroyed in many parts of France. The English Army in winter quarters in Flanders endured great hardships, since, on account of the freezing of the Dutch canals, supplies could not be got through to Marlborough. This winter was followed by famine and extraordinary mortality in France. Buffon relates that the richest people of France (even Mme. de Maintenon) were forced to live on oatmeal, no meat or wheat being available. The state of things was such in France that Louis was prepared to make almost any sacrifice for the sake of peace, but the British Government of that day insisted that he must send his armies to Spain to drive out Philip. Louis appealed to his people to support him in his refusal to accept this humiliating condition, and they rallied round him so effectively that, though Marlborough won the Battle of Malplaquet, he did so with very severe losses in killed and wounded, and the terms of the Peace of Utrecht were less humiliating to France than terms she would have accepted in 1709.

The winter of 1788-89 was very severe over the whole of Europe, and there was frost in Paris for fifty consecutive days, the Seine being frozen over from November 26th, 1788, to January 20th, 1789. The Thames was also frozen as far as Gravesend. The cold and subsequent thaw produced enormous material damage in France, many vines and fruit trees being killed by the frost, and fish dying in nearly all the ponds. This severe winter was followed by a famine in France, and one can readily imagine that the misery it brought helped to precipitate the French Revolution in the summer of 1789.

The high winds which fanned the fires of London (1666), Hamburg (1842), and Chicago (1871) caused untold misery to thousands who might have otherwise escaped harm. The Great Fire of London owed some of its destructive effects to the fact that it came at the end of a long period of dry weather.

In the years mentioned, the severity of the weather cannot be questioned, as many chroniclers give consistent accounts of the rigours of these winters. But few of the text-books of history mention the economic effects which they produced.

The Influence of Weather in War.

But when we come to consider the bearing of weather on war, our task is easier, though again it is not possible to find readily the instances in which weather has been an important factor. I have never seen in the index to any text-book of history, or even in the index to such books as Hamley's "Operations of War," a single reference to weather, fog, rain, snow, wind, or any other meteorological factor. Most writers appear to regard weather as so inevitable and ever-present as to be unworthy of discussion. In spite of this, there is available an enormous mass of scattered information relating to weather in warfare, and the difficulty I find in approaching this part of my subject lies, not in the lack of information, but in the fact that the information available consists of a vast number of isolated facts which do not readily admit of being presented as a coherent whole.

Weather can affect the course of war in many ways—by killing the soldier, and particularly the wounded soldier, with cold, by destroying his mobility by excessive rain or sudden thaw, by increasing his mobility

through drought and frost, by hiding his movements in fog, by parching him with excessive heat, or by drowning him or his transport at sea. Indeed there is no feature of war which may not be hindered or rendered impossible by unfavourable weather, or facilitated beyond expectation by favourable weather. Many of the examples I have culled from various sources are of chance occurrences of fog, rain, storms, etc., which recall the dictum of one of Shakespeare's characters: " Fortune is painted blind, with a muffler afore her eyes, to show that she is fickleness and mutabilities, and variations "; and on these chance occurrences have hinged events which have changed the destinies of nations. It is an instructive game to consider how history might have followed a different course had some apparently casual fog or storm not occurred at a particular time. I can only deal with a few selected cases in the limited space at my disposal, and no claim is made that these are the most striking cases which might have been selected.

As a general rule, we may say that in war fog favours an attacking force or a defeated army, while heavy rain or snow favours the defending force. Violent storms of wind at sea hinder any exposed fleet. In naval warfare under modern conditions, poor visibility favours the fleet with the best armoured protection, while good visibility favours the fleet with high speed and long-range guns.

The conjunction of wind and tide which enabled the Israelites to escape from the Egyptians across the Red Sea is too well known to require more than a passing mention. So is the Old Testament story of the battle between Joshua and the five kings of the Amorites, in which more of the Amorites were killed by hailstones than by the Israelites with the sword.

The history of Ancient Greece is rich in examples of the effects of weather on war. In their attacks upon Greece, the Persians were unfortunate in the weather which they had to endure. The first Persian attack in 493 B.C., under Mardonius, was carried out by a joint military and naval force. In seeking to double the promontory of Mount Athos, the fleet was overtaken by a violent storm which destroyed 300 vessels and drowned or dashed on the rocks 20,000 men, and Mardonius led his army back across the Hellespont. The next Persian invasion, in 490 B.C., was destroyed by the victory of the Athenians at Marathon, and Greece was then left undisturbed until 480 B.C., when Xerxes set out with an enormous army and an equally enormous fleet to avenge Marathon. According to the figures of Herodotus, the whole armament consisted of over two and a quarter million fighting men, of whom about a quarter were naval, and some three million attendants, slaves, crews of provision ships, etc. A double bridge of boats was thrown across the Hellespont to facilitate the passage of the army, but no sooner had they begun to cross than the bridge was destroyed in a storm. After it had been reconstructed, the vast army took seven days and seven nights to cross. After the Pass of Thermopylae had been forced, the Persian fleet, while anchored off the coast of Magnesia, was overtaken by a violent storm, which lasted for three days and three nights, and at least 400 Persian ships-of-war were destroyed, together with many transports and much treasure. The Greek fleet at Chalcis, being sheltered by the Island of Euboea, was not exposed to the storm. The Persians then sent a fleet of 200 ships round the island to cut off the retreat of the Greeks, whom they were confident of crushing, but during the next

night a storm destroyed this detached fleet completely, and did considerable damage to the main Persian fleet. Even after the indecisive battle which followed, the Persian fleet still numbered about 1,000 ships-of-war, the Greek fleet being about a third of this number. But in the Battle of Salamis the Greeks gained a signal victory, and routed the Persian fleet, thereby removing the Persians' main source of supply. The Persian retirement to the Hellespont was endangered by snow-storms and extreme cold, and the bridge over the Hellespont was found to have been destroyed again in a second storm, and only a miserable remnant of the original force returned home. The Persian menace, thus checked by the weather and the Athenian fleet, was never renewed.

The history of Ancient Rome is also rich in examples of weather affecting military history, as when Varus, the first Roman Governor of Germany, and three Augustan Legions, were destroyed by the Germans in the swamps of Lippe, after many days of continuous torrential rain.

The Norman Conquest of 1066 was vitally affected by weather. William of Normandy was kept weather-bound in port for six weeks. While Harold was awaiting him on the South Coast, word was brought that Harald Hadrada, King of Norway, had landed on the North-East Coast, and Harold had perforce to march northward to meet him. The invaders were almost completely destroyed at the Battle of Stamford Bridge, but three days later William landed at Pevensey. Harold marched hurriedly south with only a part of his forces, but even then, with an army sadly depleted by the losses at Stamford Bridge, he was only defeated at Hastings by a narrow margin. It is not unfair to assume that, had William not been delayed, so that Harold could have met him with fresh forces, the result of the Battle of Hastings would have been reversed, and the Norman Conquest would not have materialized.

Edward IV appears on several occasions to have been singularly favoured by weather conditions. In the campaign which gained him his crown in 1461, after being proclaimed King in London, he pursued the Lancastrians who were retreating northward. The two armies met at Towton, the Lancastrians being in greater numbers, but one of Edward's subordinates, Fauconberg, took advantage of a snow-storm which was driving into the faces of the enemy to gall them with arrows until they preferred to make a disorderly charge rather than endure it any longer, and Edward's victory was soon assured. Again in 1471 when the same king landed in England after some years of exile, his campaign virtually closed with the Battle of Barnet, a battle fought in fog so dense that each side outflanked the other without being aware of it. The centres fought desperately for three hours, and in the fog Warwick's men, mistaking Lord Oxford's silver star with streamers for the "Sun of York," made a vigorous onslaught on their own forces, and so turned the scale in favour of Edward, Warwick being defeated and slain.

During the following century inclement weather saved Vienna from the Turks, when Solyman the Victorious set out to take Vienna in 1529. The march of the Turks to the Danube was carried out in torrential rain, which made marching laborious, and the transport of stores almost impossible, and prevented the transport of any heavy siege guns. Cold and hunger forced the Turks to raise the siege after about a month, to the great relief of Vienna.

The life of Napoleon affords an example of a great man who contrived

on many occasions to rise superior to the chances of weather, and even to make use of them, but he was several times favoured by weather. In 1799, when he was returning from Egypt to France with only two frigates, he had to run the gauntlet of the British fleet under Nelson, which was patrolling the Mediterranean. In a fog he contrived to pass in safety near the patrolling fleet, and landed in Provence in October, 1799. At this time, the Napoleonic Wars were yet to come. Ludwig, in his recent Life of Napoleon, states that it had been decided that the frigate which carried Napoleon should be blown up rather than surrender to the English, and so the fog which hid it from Nelson had an overwhelming effect upon the history of Europe.

In many campaigns, Napoleon showed great determination in the face of unfavourable weather. Just before the Battle of Wagram, in 1809, floods in the Danube washed away the bridge on which he relied for his communications not less than three times, and where a lesser man might have been frightened into retreat, Napoleon persisted, and won a signal victory at Wagram, which forced Austria to sue for peace. Again, in October, 1806, at Jéna, while the Prussian troops were shivering in the cold night fog, the French troops got through the defiles, and it was only when the sun dispersed the fog at 9 a.m. that the Prussians realized the magnitude of their danger, too late to avert defeat, though they were not disgraced, particularly in view of the fact that they were outnumbered by the French nearly by two to one. But on the same day, at Auerstadt, thirteen miles north of Jéna, a force of 27,000 French under Davoust defeated more than 35,000 of the choicest Prussian troops. Davoust had profited by the fog to seize the heights which commanded the high road, which was the line of march of the Prussians, and this became the deciding factor in a battle which ended in a complete rout of the Prussians. Thirteen days later, Napoleon entered Berlin in triumph.

Napoleon made use of fogs on many other occasions. In 1808 he captured the Somosierra Pass in Spain, which had been regarded as impregnable, with only a few squadrons of the Polish Cavalry of the Imperial Guard. Emerging from the mountain mist, thickened by the smoke of Spanish guns firing at the French forces below, the Polish Horse sabred the gunners, and threw the Spanish force into a wild panic.

But, on other occasions, Napoleon was curiously thoughtless of weather, particularly in his march on Moscow in 1812, which was made with complete disregard of the circumstances. The winter of that year set in later than usual, though when it did come it was severe. It is sometimes suggested that Napoleon was defeated by unusually severe weather in this campaign, but the truth is that he was defeated by his growing incapacity to face facts—the relevant facts being (*a*) that Moscow was not, as he had imagined, the heart of Russia, and (*b*) that there was a winter in Russia every year. Napoleon set out on his return from Moscow on October 19th with 115,000 men, out of the original army of 600,000 who had crossed the Memen for the Conquest of Russia, and of these only 20,000 famished, frostbitten, unarmed spectres got away from Russia.

In the campaign of Italy in 1796, Napoleon was defeated by Alvinzi at Caldiero after a stubborn battle in heavy rain. The French could not bring up their guns through the thick mud, and so could not cope on equal terms with the Austrians, whose guns were already in position.

The Battle of the Katzbach in August, 1813, between the French, under Macdonald, and Blücher's Prussians was largely determined by the torrential rain, since the French guns could only be moved with great difficulty through the mud, which before long had also exhausted their cavalry. The French muskets were rendered well-nigh useless by the ceaseless rain, and when in the afternoon Blücher led a dashing charge of Prussian and Russian cavalry against the French, the weary men of Macdonald's army broke and fled, leaving Blücher the gainer by 130 cannon, 18,000 prisoners, and vast quantities of ammunition and stores.

During the night before Waterloo, torrential rain fell steadily until 8 a.m., after which only light drizzle fell intermittently, but the ground was so sodden that it was impossible to move men or guns freely, and Napoleon's attack upon the English army was delayed until 11.30 a.m. The delay in the attack, combined with Ney's failure to defeat the Prussians at Ligny, and Grouchy's failure to prevent Blücher's advance to Waterloo, combined to bring about the defeat of Napoleon. It is fairly certain that the issue of the day was largely decided by the weather. Had Napoleon been able to attack early in the morning, the battle would have been decided before Blücher could have brought up the Prussians. It is, however, questionable whether the fall of Napoleon could have been delayed for many years, in view of the strength of the enemies allied against him, and the fact that the French were at that time only half-hearted in their desire for the war. But at best we can only surmise what might have been the outcome of a French victory at Waterloo, which might have been a fresh inspiration to the French to pursue their military schemes.

There was a fog over Long Island on a night in August, 1776, which affected the destinies of many. During the preceding day, Howe had defeated Washington in the Battle of Long Island, and there was a British fleet in the East River to cut off the retreat of the defeated army. But in the thick fog, Washington and his army silently escaped to New York. There was more in this than the escape of a defeated army. It meant the eventual success of the War for Independence.

The detailed accounts of the American Civil War abound in examples of the effect of rain on military operations. Lee's movements to the Rappahannock in May, 1863, and his retirement after the defeat of Gettysburg were both hampered by heavy rain which made the movement of guns across the muddy ground a very slow and laborious matter.

Snow has always been a formidable obstacle to military operations, yet the Alps have been crossed by more than one army. Hannibal, the Emperor Majorian and Napoleon have all achieved this task. But of all operations carried out in snow, surely the most remarkable was the advance in 1241 of the Mogul invading army under Sabutai, from Lemberg to Gran, when these mounted troops covered 180 miles in three days over country deep in snow.

Ice, on the other hand, has frequently been of assistance in war. The Scottish army, under the Earl of Leven, which acted in conjunction with the Parliamentary forces in England, reached the Tweed in January, 1644, at a time when the river was covered with ice so thick that the entire army crossed without delay or accident and succeeded in reaching the Tyne in time to cross that river before the thaw came. In 1658 Charles X of Sweden marched his entire army, men, horses, guns and supplies, across the frozen belts to besiege Copenhagen. During the

severe winter of 1794-95, the English troops under the Duke of York in Flanders suffered greatly from the intense cold. In a few weeks, the French Army, under Pichegru, overran the whole of Holland and captured Amsterdam. The canals, rivers and ditches were all frozen, and so offered no impediment to the advance of the French, who were not even confined to the roads, and thus their line of advance could not be foreseen. It has been said that the French even sent a force of cavalry and light artillery across the frozen Zuyder Zee in January, 1795, and captured the Dutch fleet frozen up in the Texel, but this is denied by Dutch writers.

Fog introduces a greater element of chance into war than almost any other aspect of weather. I have already cited several cases in which fog was kind to Napoleon. Another memorable battle in which fog played an important part was the Battle of Lützen in 1632, between Gustavus Adolphus of Sweden and Wallenstein, the mystery man of his age. The morning dawned thick with fog, and no movement was possible until nearly noon. In the meantime, Wallenstein had recalled Pappenheim, who had taken a large body of troops to attack Moritzburg, near Halle, and the delay gave Pappenheim time to arrive at a critical stage of the battle. A thick mist obscured the fighting, and Gustavus, when leading forward his centre, had in his eagerness outstripped all but a few of his men, and was wounded by a musket ball. As he was being helped back, faint with loss of blood, he ran into a party of Imperial Cuirassiers, at whose hands he met his death. After a grim struggle lasting till evening, the Austrian Army, under Wallenstein, was shattered and retired in confusion, losing all its guns and baggage. The issue of the Battle of Lützen was decided by the superior fighting and leadership of the Swedish Army, but the death of Gustavus must be ascribed to the fog. Without their king, the Swedes had no leader capable of taking full advantage of the victory of Lützen, with the result that the "Thirty Years'" War went on for a further sixteen years. The death of Gustavus was a disaster for the Protestants of Europe, who were left leaderless.

Nearly a century after Gustavus, the Swedes made the most effective use of a smoke barrier to cross the Dwina in 1701, in the presence of a strong Saxon army. There was a northerly wind blowing at the time, and the Swedes, who were on the north bank of the river, fired vast quantities of wetted straw in the Swedish camp. Under cover of the smoke they sent boats across the river, laden with more straw, to which they set fire on the south bank of the river. The Saxons were so blinded by the smoke that they were unable to prevent the Swedes from crossing. Was this the first use of an artificial smoke-screen?

Space will not permit of my referring to the fog which led to the defeat of the great Duke of Montrose at Philiphaugh in 1645; or the many occasions when Marlborough carried out movements in the face of the enemy by making the most of foggy weather; or the mirage which stopped the fighting north of Baghdad one day in April, 1917.

The English Official History of the Russo-Japanese War is full of references to the effect of weather on isolated operations. The efforts of the Japanese to block up the Russian fleet in Port Arthur were repeatedly hampered by severe weather, though they made full use of the frequent fogs to lay mines in the entrance to the harbour. After the Battle of Te-le-ssu in June, 1904, the retreat of the Russians was

covered by a blinding storm of rain, which made pursuit by General Oku impossible. The Official History mentions numbers of occasions on which fog helped the Russians to retreat in safety, of fighting stopped by snow-storms, of trenches flooded by rain, of swollen rivers and broken bridges, the last of which on one occasion broke up General Kuroki's army into two. I make no attempt to deal with these details, but I would draw attention to the Battle of the Sea of Japan on May 27th, 1905, in which the Japanese fleet, under Admiral Togo, defeated the Russian fleet, under Admiral Rozhdestvensky. It is important to realize that at that time, although the Japanese had just won the land battle of Mukden, the Russians were by no means overwhelmed. Japan was in the unusual position of having practically the whole of her land forces overseas dependent on sea transport for food and war material. At the same time, she had practically no facilities for making good the wastage of ships, as she possessed no single yard in which an armoured ship had ever been built. The need for a decisive victory was therefore urgent, as the continued existence of the Russian fleet would have been a perpetual menace to Japanese sea communications, while defeat in the naval battle would have meant for Japan a humiliating end to the war. The day of the battle was so misty that the fleets were forced to fight at short range, and the effect this had in forcing a quick decision is beyond dispute. At the close range of 5,000-6,000 yards, at which most of the fighting took place, the effect of the Japanese fire overwhelmed their opponents. Had the battle been fought at longer range, the decision would probably not have been obtained before night made the continuation of the general action impossible, and the Russian fleet, or a large part of it, might have escaped and reached its objective, Vladivostok. Such a result would have been a disaster to the Japanese.

The Russo-Japanese War has another interest in that it was the first war in which a definite meteorological service was maintained in the field. Nothing is mentioned of this in the Official History, but Professor Okada, now Director of the Meteorological Office at Tokyo, once told me that during the war he was in charge of a line of meteorological stations behind the Japanese lines in Manchuria.

According to the English translation of the German Official History of the Second Boer War in South Africa, the heavy rain during the last week of February, 1900, turned the veldt into a quagmire, and forced Lord Roberts to delay his advance for a week, so giving the Boers time to concentrate their commandoes, and contributing to the protraction of the war till May, 1902.

So far I have only dealt casually with naval operations, but there are a few sea events upon which I must touch before leaving my subject. The Invincible Armada of 1588, after a very warm reception from Drake in the Channel, was glad to run before the storm which arose suddenly, and of the 130 ships which sailed from Spain, less than a half returned there, the winds, waves and rocks of the north-west coasts having completed the destruction begun by the cannon in the Channel. This defeat was the end of the pretensions of Spain to dominate the civilized world. A second Armada in 1597 got as far as the Scilly Isles before it was blown back by a northerly gale, losing many ships in the Bay of Biscay. More than a century later, the Italian adventurer, Alberoni, revived the Spanish fleet, and in 1719 a third Armada left Corunna for England, with a view to restoring the Stuarts in England. Off Finisterre this

fleet ran into a hurricane which lasted twelve days, and only two frigates reached the coast of Scotland, where they surrendered. This loss, added to the destruction of another Spanish fleet off the coast of Sicily by the British fleet, ended the pretensions of Alberoni, and established British naval supremacy in Europe.

The destruction of the French power in India was much facilitated by the great hurricane of October, 1746, in which the French fleet holding command of the sea was caught in the open roadstead of Madras, and wrecked or dispersed within a few hours.

In the wars of the future, weather will be a vitally important factor to consider. On land the influence of wind on flying operations, of visibility upon gun-ranging and bombing, of wind and temperature distribution on smoke-screens and chemical warfare generally, of rain and sudden thaw on transport, suggest themselves as of vital importance to the conduct of war. I have endeavoured to show that past history is strewn with events which were decided by weather. The lesson for the future, if I am called upon to provide a lesson, lies in the need to make use of changes of weather whenever possible, by watching for them and adapting operations to the weather. Beyond the question of any material lesson for the future, I suggest that the study of the way in which history might so easily have run a different course, provides a stimulating mental exercise, and helps us to attain a proper attitude of intellectual humility.

On The Dal Lake.

KASHMIR—THE LAND OF HONEYMOON

By Jane Purves.

To roam at will on water or land is the aim of most artists the wide world over. It is also the determination of every engaged girl in India. India, except for a few vivid weeks after the rains, is sunscorched and colourless, but Kashmir, that jewel of colour, is set in the arid crown of the Himalayas as the mythological gem in the toad's skull of old.

The long hot journey over the plains by train to Rawal Pindi is well worth the fatigue, though nerves are racked by the rattle of the train over sleepers, and the hot airless stuffiness of a carriage shuttered against the blinding Indian sun above. What matters if the sides of the carriage are hot to the touch, if feet shift on the floor in search of a cooler spot, if ice is short, and squashes fail?

The blessed peace of the Jheelum is ahead.

It is curious how often old folklore has a solid substratum in fact. The Kashmiri believe that Kashmir was once the home of all the myriad thousand water gods of India, divinities who deigned to inhabit the form of a water-snake that their adherents might have something tangible to worship. Oddly enough, when the sharp peaks of the Himalayas were pushed through the earth's crust in the birth throes of the world, the great hollow between the peaks that is now Kashmir was then one great lake, as geologists have discovered by the countless shells and fossils of that age. But water must find its own level. In time the great pressure of the lake, swelled year by year by melting

snows and glaciers, forced a way through the limestone in the hills, and cut that great gorge nearly two hundred miles long by which the Jheelum river carries off the summer freshets from the snow-fields that ring the vale of Kashmir.

Somewhere about here Alexander the Great fought his first battle with Porus, before he descended on the plains of India, via the Chitral valley, where coins and broken shards from his camps are frequently found. My husband, who was on service in the expedition against the Swatti in 1915, dug up one or two of these coins, which, in a flash make time of no account as they transplant us to the days when the Greek ruled civilization.

Though the world's battles may have raged round Kashmir, they rarely entered the kingdom, for Kashmir is neither India nor Asia to be fought over.

It is a scattered mosaic from Paradise.

The post house at Domel is the threshold of the vale. Here the Jheelum and Kishengunga meet, running side by side for miles, their clear and body-laden waters distinct for miles until they mingle under high cliffs at a narrow bend of the gorge. Graceful pomegranates, red as the lips of lovely Anarkali, bloom freely beside the purling waters, and big bushes of oleander, whose fragrant pink blossoms her lover made his horsemen wear in their caps as they rode scornfully up the valley to Kashmir.

The variety of the country is oddly interesting. At the old fort of Uri, the district is plain English. It is just like a village green, with bungalows set in a ring of poplars. A little farther on, the blue forests of deodars begin growing above deep gorges with powerful waterfalls, and the first of the many beautiful little temples that mark the way up the gorge is seen half hidden in the cedars.

Baramulla, that mighty watergate, is the one outlet of the waters of the many lakes of Kashmir. All is quiet peace, green fields, alders and willows, a pastoral scene above the tropic wealth of deodars, 5,000 feet above sea level. It is here that one leaves the heat, rattle and dust of the 170 miles of road journey for the sudden exquisite peace and quiet of a boat.

Mountain tops gleam white ahead, particularly great Haramukh. Great *chenars* are reflected in the green and blue water. Here are clustered a handful of tiny ragged huts about a simple mosque. There is a buffalo wallow, the pointed horns of the happy beasts sticking out like dead boughs in a winter flood above the surface. Edging the river, the native life of the country goes on in all its simplicity; family washing is done, *dhobies* run chanting as they reckon up their client's wash, men are bathing, women husking rice.

The river runs fiercely in parts. One is towed calmly enough along-

side a bank, but should one desire to cross that deceptive water, the boat is often taken a mile or more down stream before the crossing is made. Who cares? What is time or money so long as life lasts in this land of faery?

The sunsets are pure magic, gorgeous fiery tints that gleam and dazzle as a fine piece of opal matrix. Colours die down in the west

In the Liddar Valley.

into the soft green and purple of a dove's back, and the high still peaks of Karamukh catch the last reluctant rose of a sinking sun.

And the nights. None can escape the magic of those still moonlight nights, warm and wonderful. Stars gleam overhead in myriad diamond hues to be reflected in the still black waters round the boat, until it is little to be wondered at that the world of responsibility and work is forgotten, as a huge golden moon looms slowly overhead above the gilded peaks, aloof in majesty, and laughter and music from distant boats come faintly over the water that ripples so lazily alongside.

The great Wular lake, the largest in all Hindustan, is two-thirds of the way up from Jheelum to Srinagar. Water lilies, pink, white and yellow grow here in huge patches; water lilies that millionaires in the western world spend thousands in acclimatizing in their gardens, that here are fed to cattle. Away to the south is the great white range of Pir Pantsal, the barrage between the scorching hell of an Indian summer and this delicious fantasy of heaven.

The Wular is bounded by an incomparable ring of icy peaks spearing the deep blue of a matchless sky, their lower alps lost in mists of pearl and lapis. But prehistoric ruins lie deep in the waters of Wular, which year by year grows smaller as reclamation work goes on. One day it will all be farmed with paddy, and more people will be fed, though one more beauty be lost to earth. But for many years to come one may lie in peace under the *shamiana* and be glad that it is someone else's job to toil up the great road to Gilgit, that can be so clearly traced zig-zagging its way to the roof of the world on the range to the north.

The way on to Srinagar is as full of bends and twists as Harry Lauder's curly stick. The air is fragrant with the delicate perfume from fields of purple and white iris, with paddy fields beyond. The people seem simple and contented, not bothering overmuch so long as there is a handful of sweetmeat or honeycomb after the curry at night.

Srinagar, reached at last by waterways that never tire, is the dream city of the world. Space is precious, buildings are close together and roads and alleyways small, yet nevertheless the national love of flowers is so great that there is always room for a garden. A stone fretted balcony hung above the swift river will have a curtain of pink geranium flaring dazzlingly over its greyness. Here a purple bougainvillia will hang rampant, its colour royal in sunshine, but dull in shade. Jasmines perfume the air, and roses drown the reek of hot humanity in the bazaars. All is fair on the surface, but many a rotten cellar and unsavoury hovel hides the rags and tatters of countless beggars and coolies, for crowded, murky Srinagar is as plague-ridden as all other Eastern cities.

Srinagar has all the rags and colour of the East set in the quiet water ways of Venice. Masses of Persian lilac hang over the walls as the boat is slowly punted along, the men straining to gain inch by inch on the flood. Many a romantic peep is seen as the boat passes. Nominally, purdah obtains in the best families, though the peasants roam free, unveiled, but windows overlook the river, a boat passes on, and there are none to note if East and West exchange smiles ere the jalousies are closed.

Boats are moored at the other side of the city, at Chinar Bagh, where there is plenty of English comfort, as at Henley; but all around are

the mystery and magic of Kashmir. At each turn the fresh reflections of peak, forest or temple seem lovelier than the last. As Sir Francis Younghusband says, "Kashmir is a jewel set in earth's forehead. Each spot in Kashmir one is inclined to think the most beautiful of all."

Day after day is spent on the lake. Those whose lives are easy in the plains get up treasure hunts, water polo, races, gymkhanas, and all

A Wayside Temple.

the other delightful ways of killing time the Anglo-Saxon invents wherever he goes. Others who find twenty-four hours all too short for the day's work loaf and dream, hunt out curios in the rich bazaars, or visit the many clever crafts-workers in the old town. If energetic, they climb, hunt or shoot.

The *papier mâché* workers have handed on their craft from father to son since the old days long ago when King Zain-ul-ab-i-din brought it from Samarkand. At first it was used only to decorate the bowshafts of the archers, and to this day it is known as *Kamangari,* or Bow Craft. The workers are a race apart, with thin delicate fingers and womanish

faces. Their delightful work, with its exquisite paintings of tiny flowers and ornaments, is known all over the world.

Another very important manufacture is silk. All the mulberry trees are under State care, 30,000 trees being planted yearly. Rooms to my lady silkworm are given up in the workers' small homes all over the town. Indeed, the ribald declare that if you only hold your breath when all is quiet and still at midnight, you will hear the soft ceaseless rustle of the leaves, as the silkworm munches steadily on.

Unless you have a very long leave to spend in Kashmir, it is best to leave the workers' studios alone when buying curios, and get them from Samad Shah, or Abdul Aziz, where prices are fair, though still of the opulent East.

The copper bazaar throws its usual spell over the traveller. Most buy a square jug of copper shaped like a duck, called *batish* or hen duck, made for blowing up a dull fire by its escaping steam when heated.

Srinagar simply swarms with beggars, an honourable profession and profitable. Some even go to their pitch on horseback!

> " Hark! Hark! The dogs do bark,
> Beggars are coming to town,
> Some in rags, some on nags,
> And some in velvet gown."

Some of them are shamelessly healthy, though others are unspeakably foul and disfigured with smallpox, that destroys half the population of Srinagar. As long as to give helps one to acquire merit in Paradise, their ranks will be swelled by the idle.

Native life has many an oddity. Milkmen pad easily about the city with bare feet at a jog trot over the uneven roadways. They carry two or even three big milkpots, one on top of another, so carefully that no butter spots are ever churned in the cream.

More rarely, a funeral boat passes along the water, strings of white flags fluttering from end to end of the long boat, the landing stage white with more. The shrill ululations of hired mourners wail from a small *shikara* towed aft.

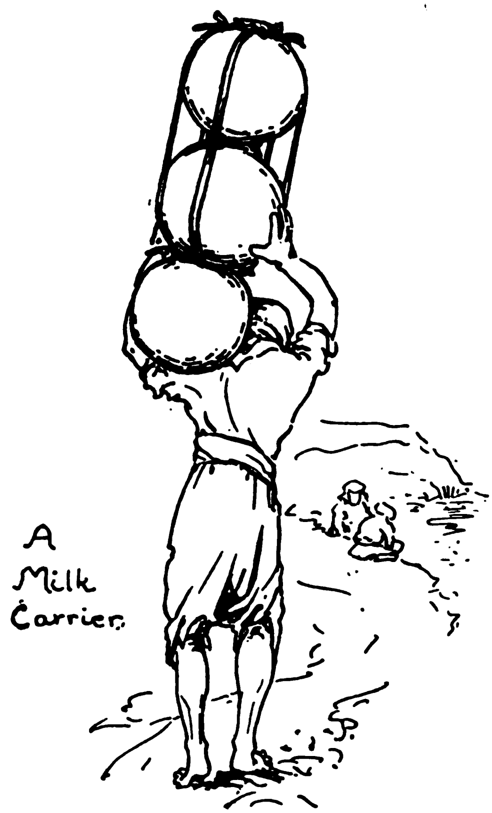
Cultivators in deep digging work two men to one spade. One digs in, another lifts the spade by pulling on a rope tied on the haft near the spadehead. They are good market-gardeners and fruit growers. The Maharajah is a keen orchardist, growing new fruit on a trial State Farm. Cherry orchards stretch for miles into the country, for cherries are a favourite fruit of the Kashmiri, as well as of his visitors. As the Emperor Jahangir wrote by the hand of his scribes:—

" The cherry is a fruit of pleasant flavour. One can eat more of it than of other fruits."

It is a rare country road without its wayside *Ziarat*, or shrine of dead saints, like tiny dolls' houses. Jasmine and roses break through the roof. Coloured rags are stuck on the thorns to register some woman's vows to the saint, and offerings of little *chirags* litter the floor, the small earthen lamps of the poor with pebbles thrown in the oil to save one-hundredth of an anna. A chain hangs before its door, for the faithful to grasp ere they enter, that all may know they speak truth by the prophet.

The gardens in the country are so beautiful that Jahangar said anyone could have India so long as he could keep Kashmir and the Shalimar for his beloved and himself, in real film hero fashion. Nine hundred gardeners keep these lovely gardens in order, and all visitors are free and unmolested by keeper or beggar. There are no policemen or guards. The beauty of the Shalimar is held in trust.

On the lake, the fishermen go out at dusk with lamps, spearing *mahseer*. Sometimes they use a huge triangular net as big as a hay stack, mounted on spliced bamboo. In many parts of the lake there are most curious floating gardens. Huge piles of weed have matted together; the indefatigable cultivator throws soil on top, and grows huge crops of melons, tomatoes and cucumbers on land that, oh joy! is rent and tax free.



Some of the Kashmiri, the Mohammedans, wear padded sleeve ends twice as long as their arms. These they use as kettle holders, or when drinking scalding tea, or even when nursing their *Kangris* or earthen hot-water bottles. When they want a Turkish bath, they just sit down wherever they may be, the *Kangris* between their knees, their sleeves wrapped around them, and hey presto! in a trice their skin responds.

One comic little trait in the Kashmiri is his reverence for the printed word. This is carried to such an extent that one may often see the selvedge printing of most cotton goods, say, "Horrock's Best Twill," carefully preserved in making coat, trousers or sleeves.

Some think the Kashmiris are the lost tribes. As you bargain in the bazaars, you are certain of it. There are, however, ruins in the country that are much older than that, for those of a temple at Martand are supposed to be 5,000 B.C.

Unlike most Eastern countries, there are many birds in Kashmir. The bulbul has one very sweet note, though it is not to be compared with the English nightingale. Ring doves flutter and coo in the woods, golden orioles dart swift as a flash through the oleanders; hoopoes strut about puffed with conceit, herons stand on one leg for hours in the rushes by the water edge. Countless lake terns fly about, that lay their eggs floating on the surface, far from the depredations of their enemies, the rats.

One of the breathtaking views of the world is from the roof of the citadel at Srinagar. Here, as in a jewelled panorama, the old fort is set in long almond orchards, the Dal lake near by; afar the distant Wular, the great cleft of the Liddar valley, the mighty Haramukh before, and behind, the white majesty of the Pir Pantsal. A princely land, a land of princely lovers, where once lived Shah Jehan, who built the Taj to his dead darling's memory.

What wonder that all who have ever been within the enchanted valley dream of a happy time to be when once more their boat breasts the furious waters of the narrowed Jheelum, and Paradise itself lies open round each reach.

Fishing for Mahseer
on the Jheelum River

THE NOAH'S ARK OF WORDS.

By William H. Pick.

Someone, probably tutored into a gentle cynicism by overmuch attendance in committees and conferences and councils and other collective communings, once declared that the one mark whereby a good speaker could be known was that he could speak around a point and at a very considerable distance from it without ever drawing uncomfortably near—and it may be that, on reflection, the same someone would have extended the comment to a good writer.

Accordingly, I, too, not to miss meriting praise, would start sufficiently far from the point in writing in a manner truly desultory of words to remark that mankind may be divided into four classes which may be named, for the sake of brevity, if not of clarity, the varieties Debrett, Whitaker, Telephone Directory and the Unknown: for is it not true that if a man be of really uncommon brand he is blazoned in Debrett, if respectably solid in the compilation due to Whitaker, if merely useful or open to callers in the huge tome issued by the G.P.O., and if neither blue-blooded, solid nor receptively useful, but just man without qualifying adjective, then posterity is granted no memorandum of his existence?

Which prolix preamble leads inevitably, as the discerning reader was doubtless fully aware it would, to dictionaries, for there comes the irresistible temptation to see what man makes of man when he fetters him in those prison houses of words—and this temptation, when yielded to, leads to the result, very startling, indeed, to pessimists and cynics and other believers in human frailty and incapacity, that for once man is magnanimous to man inasmuch as "man" is defined quite briefly as "a rational animal" and that there are no disparaging reservations whatsoever.

But after the first glow of satisfaction, doubts arise. Man a rational animal—but how untrue! So-and-so is a man, and, oh! well! courtesy forbids that I finish. Moreover, there are quite a number, even quite a large number, of excellent individuals who would cheerfully add their superscriptions to the doctrine that "most men are fools"—even forgetting in their haste to notice that there is always one more example than they imagine—and such individuals would, without any undue pressure, descend from the abstract to the particular and adduce definite cases in support of their thesis. Or

again, imagine the sentry, alert but nervous in a post of danger, scenting enemies all around, suddenly espying a human being advancing stealthily towards him, and imagine that same sentry suddenly, fearfully, ejaculating "There's a man!" Is he being magnanimously polite and just paraphrasing "There's a rational animal"? I wonder! Or, is the diminutive three-quarter playing his first game at "Rugger" and watching the relentless and fearsome apparition of the many-stoned forward bearing down upon him, thinking of the man rushing at him in the same, gentle, complimentary terms of rationality? Or doesn't he rather think hurriedly, but clearly, that at that moment there is very little evidence of rationality on the field at all?

And further, honesty compels me to chronicle another disagreeable matter. While many in the present would deny that man is rational, some in the past have even denied that he is an animal. A certain La Mettrie, for example, wrote a booklet in the eighteenth century under the title "Man the Plant," and then, as though to emphasize his contempt, followed it with a more pretentious volume called "Man the Machine." And later, Mark Twain published his one serious work, after pondering upon it for a quarter of a century, which work took the form of an excursion into Philosophy and bore the title "What is Man?"—and this question he answered by agreeing with La Mettrie that man is just a machine. But having deprived man of a soul he was not content to leave the soulless residue in peace, but proceeded to lecture it in real and hearty fashion—which lecturing of a soulless lump was just about the most subtle joke, howbeit quite unconscious, of all Twain's humorous career. And about the same time Carlyle called man "a forked radish," but of that I will say nothing.

All of which makes one liken a dictionary—even that most famous one due to that Embodiment of English Commonsense, Samuel Johnson, LL.D.—as just a Noah's Ark. And it will be admitted, without any great diversity of opinion on the point, that the tiger in Noah's Ark must have found it exceedingly difficult to be comfortably natural, for, if it had been, it is to be feared that the Ark would have failed in its function of salvation and would have lost much of its meaning for futurity. In short, and to change the animal that is pointing the moral, a word in a dictionary is like a stuffed salmon on a Victorian sideboard. It may bear some semblance to the true fish, but it is, at best, only one attitude of that fish, and, moreover, the naturalness of the fish is not made any the more obvious by the anti-macassar trimmings around it and about. After all, the salmon is a vastly different thing to the fisherman who sees it in its natural habitat, the water, from what it is to the humble town-dweller who has only seen it in the artificial habitat of a tin. In fact, there must be as many

kinds of salmon as there are minds that have ever thought about salmon.

But there surely must be a standard salmon, a salmon of which all other salmons are imitators; and Plato argued that the perfect pattern is laid up in heaven. That is indeed true philosophic detachment, but experimental investigation to prove Plato right or wrong in the matter is clearly difficult: and for standard we sub-heavenly mortals have, perforce, to take the third degree one laid up in a dictionary—third degree, because first there is the extra-terrestrial pattern; second, man's idea of that perfect pattern; and third, his interpretation of that idea "cribbed, cabined and confined" by words.

Perhaps the best definition extant of the dictionary meaning is that it is "the skeleton of the full meaning; something fixed and definite, to which each person who uses it adds his own flesh and blood." But what strange and disconcerting results can come from that individual adding of flesh and blood! A case quoted by Sir John Adams, the well-known Professor of Education, may be given to illustrate the dangers of this necessary freedom. A schoolboy, struggling with his French, showed up the sentence: "M. Rondeau était la meilleure allumette de la ville." His dictionary had given him for "match" the choice of égal, pareil, parti, mariage, alliance, allumette and mèche. He had rejected "mariage" as being the only one self-evidently impossible, as a man could not be a marriage. For the rest he had exercised the great gift of free-will combined with a certain sophistication. To take the first or last words offered might have suggested to his master a lack of care in research, so he compromised on "allumette." Nor, to cite another case given by Sir John, is "pater genus" an adequate substitute for "kind father."

* * *

And on reflection I do not think that it has been a very genteel deed that I have done, this making of the dictionary a thing of perplexity: but to make of it a simple thing is a task perhaps beyond any man who values truth.

* * *

And so to an end. But this I will say. To such as use a dictionary because they are backward in their spelling I have nothing but encouragement to offer, for with such I feel a real fellowship.

THE BRILLIANCY OF ADOLPHUS

It was really the Dean who first brought Adolphus Brown to public notice. By the way, we called him "The Dean" on account of a certain ecclesiastical atmosphere, a kind of pontifical solemnity, with which he invested himself. He always seemed to be wearing invisible gaiters, if you understand me, and this, combined with his quite definitely Rabelaisian outlook on life, resulted in the nickname.

Apparently the Dean went down with a severe attack of influenza, and "Doc," with every good intention, had sent Adolphus to minister to his wants. On arriving next morning to view the body, he was naturally astonished to find it in a state of hysterical revolt and high temperature.

As the Dean declared later to an interested mess, it was not so much the bright red hair, and broad Scotch accent, which had upset his sick nerves, as that Adolphus had endeavoured to "Soothe him to sleep" by reading Omar Khayyam, and was on the verge of starting for the thirty-ninth time when medical aid arrived!

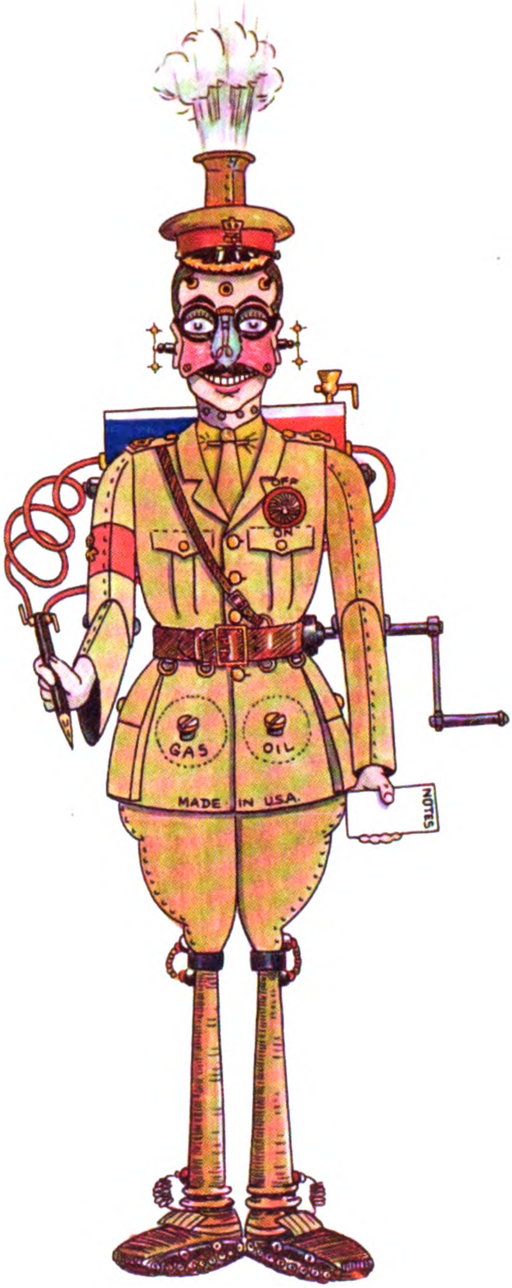
Soon after this an inscrutable providence decreed that Adolphus should be reclassified as "Driver Petrol", and, about a month later, the usual annual inspection hove on our horizon.

Our young and energetic C.O. was particularly anxious to make a good impression on the "Old Man" and for weeks prior to the event everything possible was whitewashed; brass shone like gold, and iron like silver; squads of airmen dotted the camp removing alleged litter, and it was almost a court-martial offence to drop a piece of paper.

At length the great day arrived. The Air Vice-Marshal, our mess being full, had put up the night before at the local hotel, and was to proceed to the camp by car at 9 a.m. The Adjutant, whose nerves were slightly frayed by his timely discovery that the Sergeant-Major had put flowers in the orderly-room, "Just to brighten things up, sir?" dispatched scouting airmen to the near-by town with instructions to phone when the great man left the hotel, and report his progress along the route.

Eight-thirty a.m. saw the parade ground, which was just inside the main entrance, a scene of tense activity. Finally the troops were arranged to the C.O's. liking, the ambulance stood near the main gate under the charge of Adolphus, and the officers ranged themselves just outside the Mess.

At 8.45 we learned that the A.V.M. had left the hotel, and ten



ONE-VALVE MECHANIZED STAFF OFFICER,
with double track and self-operating pen. Always cheerful, eyes never close, never sorry, never sick. Complete with adjustable spurs and F.W.B. Practically fool-proof.

Can be supplied with Top Hat and Frock Coat for League of Nations' Work.

minutes later a second message told us he had passed the half-way mark, by which time a deep and almost religious hush brooded over the camp, everyone was at attention except the C.O., who was pacing up and down Napoleonically, when—a particularly filthy looking refuse cart, piled high, the driver sitting atop, ambled slowly out from its retreat behind the hangars.

Probably the unnatural hush affected the equine nerve, for it stopped with such precipitous haste that the carefully arranged refuse, with the driver, deposited themselves on the mathematical centre of the parade ground.

Amidst the ensuing dreadful scene of panic and the weeping of strong men, Adolphus was the only man to keep his head. Starting up his vehicle, he drove straight across the only entrance, delaying the Staff car, and just giving sufficient time for an improvised sanitary squad to clear up the worst of the mess.

I believe Adolphus gave a masterly explanation of how "Me foot sorter slipped on the clutch, sir," but really he need not have bothered. He is now acting as C.O's. personal driver and, it is generally considered, will go far in the Service.

F. C.

ONLY THE DESERT CAN TELL!

THE following narrative is one of many mysterious episodes of the Royal Air Force during the war.

The circumstances, which are true in every detail, were related by a senior officer of the Royal Air Force, who was actually in command of the search party sent into the desert to unravel the mystery.

* * *

PROLOGUE.

In August, 1918, a de Havilland bombing aircraft stationed at Amman in Transjordania, was ordered, with Lieutenant Adams as pilot and Corporal Brown as observer, to fly from Amman in Transjordania, Palestine, to Abu Sueir aerodrome, near the Suez Canal in Egypt.

They left Amman at dawn, and were never heard of again.

* * *

One morning in December, 1918, an Arab was brought before the Commanding Officer of Abu Sueir aerodrome, and stated that he came from a village called El Jeb, situate somewhere in Arabia. No one had ever heard of the village, nor was it shown on any map, but by dint of long questioning of the Arab, its position was roughly estimated as about 200 miles east by south of Kantara, and right away "in the blue." The Arab stated that, whilst attending to his flocks in the desert, he came across a large aeroplane, apparently undamaged, but that there was no sign of the crew when he saw it last about two months previous. As no aircraft were reported missing from Egypt, he was at first disbelieved, but he swore it was the truth, that he had left his village and joined a camel convoy south of his village a month previously, and had travelled via the camel track to Kantara.

Eventually, the authorities came to believe there might be something in the Arab's story and he was prevailed upon to accompany Major Clarke, who spoke Arabic fluently, and a crew in a large Handley-Page aeroplane in an endeavour to locate his village of El Jeb from the air. Great difficulty was found in finding the village, but eventually the aircraft landed in the desert close to an Arab village, which luckily turned out to be El Jeb; but, unluckily, the sand was soft, and the big aircraft, in landing, turned over and crashed the undercarriage and both main planes. The crew were thus stranded in an unknown village over 200 miles from the Canal. Endeavours to fix up a ground wireless to communicate with Egypt were unsuccessful, and the only thing was to wait until further aircraft were sent out, which was done when the first Handley-Page failed to return.

About three days later, an aeroplane was seen by the marooned crew circling near the village. Major Clarke had previously improvised some ground signals from the canvas of the wrecked Handley, and

these were spread out warning the pilot of the relief aeroplane *not to land*. A search for a safe landing place was made by the marooned crew, and eventually one was discovered. Two days later the relief aeroplane returned and landed safely. Supplies, food, etc., were unloaded, and Major Clarke returned to Egypt in the relief aeroplane to report and make arrangements for the salving of the crashed Handley.

At the conference which followed at Abu Sueir, it could not be seen how it would be possible to repair the Handley, as it was quite out of the question to transport by air the enormous spare main planes required. It was found impossible also to proceed to El Jeb by road, except by camel transport, and this could be ruled out on the score of distance, 200 miles.

Major Clarke was ordered to return by air to El Jeb, to dismantle the engines of the Handley and to continue his search for the mysterious aircraft. He returned to El Jeb and next day was guided by the Arab to the spot where the aircraft lay.

It was found in a slight hollow and appeared to have made a perfect landing on hard, gravelly desert and to be in perfect condition; the radiator was practically full of water, there was sufficient oil and petrol for at least another hour's flying, and everything was apparently in order, but no trace of the pilot and observer could be seen. Major Clarke stated afterwards that the whole circumstances were mysterious and eerie. A perfectly good aeroplane lying in the stillness of the desert, where it had been for over four months, but no sign of either member of the crew.

He returned to El Jeb and, having procured a camel to carry rations and water for fourteen days, again proceeded with the guide to where the aeroplane lay. The guide pointed out the two sets of footmarks, still to be clearly seen, and with the guide, followed by the camel in charge of a camel boy, the party set out in search of the two occupants.

The footmarks were clearly seen all the time, and places were found where the two men had evidently sat down at times to rest, the marks indicating that they had laid on their backs, the edges of their helmets having made a groove in the hard sand. After following the tracks for two days which led south all the time, they next found a helmet of the type issued to other ranks, as distinct from the officer's type of helmet. The traces where the two men rested were now more frequent. Early on the fourth day, pieces of a man's shirt were found, and later a skeleton, picked clean, and lying close to it a big stone on which there were patches of dried blood. There was no sign of a struggle, but what was perfectly plain and written in the sand were two sets of footsteps which led to the skeleton, and only one set led away from it, still in a southerly direction as if the survivor had a definite objective. There were no traces of circling, which generally happens when lost in the desert.

On the fifth day, another skeleton was found, and with it just an empty water-bottle and an officer's type helmet; nothing more! The mystery was deepened by the fact that no boots or clothing of any description were found, neither was it possible to identify either of the skeletons as of officer or airman.

The second skeleton lay at the foot of a small rise, which slightly hid the country to the south. Major Clarke walked for barely five hundred yards farther to the top of the rise, and *there at his feet, not* 50 *yards*

away, was the main camel road which led from the Hedjaz Railway to Kantara. Had the second person continued another few yards he would undoubtedly have been saved, as convoys pass along this track every day. What is the answer to the riddle?

Only the desert can tell!

Epilogue.

Major Clarke returned to the derelict aeroplane, and on closer inspection found that dry rot had set in and it would have fallen to pieces if moved. Both the de Havilland and the big Handley Page were, therefore, abandoned.

Narrator's Note.—For obvious reasons, the names appearing in this story are fictitious.

WHEN OUR BUTLER WAS MARRIED

BY A MEMSAHIB.

SHARMAN, our butler in Baghdad, did most other things better than he buttled. He was an extremely handsome Armenian who spent nine-tenths of his waking life in making complicated plans to evade work. But he was honest and picturesque, and saw to it that the lesser fry did his work as well as their own, so we turned a blinkered eye upon his little way for the sake of oily black curls and a flashing smile.

Perhaps he was most in his element when superintending the dumping of some Persian trader's spoil upon our verandah. Did any exhausted pilgrim appear in the sûq with a bundle of rugs over his shoulder or some precious brass pot hidden on his noisome person, Sharman was after him like a terrier down a burrow, for this suggested possibilities of unlimited commissions to Sharman, who knew the passion of his sahib-log for rugs and curios. It was a great day for us all when the caravan came down from Hamadan. Sharman, you may be sure, was there to act as "runner" when the camel bags were emptied of their loot upon our verandah. Stitched embroidered pushteen, rose-coloured leather slippers warranted to perfume any wardrobe they were kept in with their own delicious smell; Persian silver and beaten brass smuggled through heavily bribed Customs; above all, the beautiful little rugs from Tabriz and Teheran, mulberry, rose, camel-coloured and love-blue, each with the bloom of a ripe plum on it, and the pungent scent of the Khan. What a pile!

I really must *not* begin to talk about Persian rugs just now, for if I once start I shall never stop. They are an inspiration, a delight, they are poetry interwoven with charm, sheer magic colour, they——

But, as Kipling says, that is another story.

Sharman was nearly thirty and longed passionately for a son. Daughters are less than the dust in the East, although I have seen both Arab and Hindoo fathers give a tired little daughter a ride home on their shoulders. To prove his manhood a man must have sons. Sons are to the Oriental what insurances are to the Anglo-Saxon, a very present help in time of trouble. When enemies get busy—and that's pretty frequently out East—a man likes to feel that he has loyal unbribeable sons about him, to fight his battles as no mercenary can. This is the great principle underlying polygamy—not sexual indulgence, as the West supposes.

Now Sharman's first wife had died six months before he came to us,

in giving birth to a son who lived but a day. It was time he took another wife. Inquiries were made among the few eligible maidens of the small Armenian Colony in Baghdad, and at last a suitable virgin of nearly fourteen was found, and pour-parlers began.

Our housework went to glory. At all hours of the day and nearly all the night, go-betweens haunted our compound. They scuttled from under our feet when we entered our car. They fled from our verandah when we came home. The mâli got swept into the fierce discussions, so that for two days he forgot to water my treasured pansies and cornflowers, and they died.

At long last, when, utterly exasperated, we were on the point of kicking Sharman out of the house, or into a church, the terms of the dowry were settled, and a smiling butler brought us a wreath of marigolds one morning with our burra hazri, and declared how happy he would be if the sahib would honour his wedding feast. If only the memsahib could be prevailed upon to come too, then thrice happy he, for she, the mother of sons, would doubtless so bless the day by her presence that soon his house would be filled with many, many sons.

Of course, we went.

For the month previously Sharman, hitherto extremely free and easy in his religious observances, had been extraordinarily devout, keeping the feast days in particular of the Established and Catholic churches as well as his own Armenian. Taking no chances, I suppose. All the baksheesh he could wangle from the sahib went in fees to his own archimandrite, all with the single purpose of speeding that longed-for son.

At last the great day came.

We were invited to dinner first; then would come the wedding ceremonies about nine o'clock.

We found our way through the crowded bazaars to the little earth-built house squashed down an alley, a top room of which was to be his entire home, with the use of a corner of the roof above for cooking, etc.

The whitewashed room was lit by an unglazed slit of a window under the ceiling, too high to see aught but a tiny strip of sky. Maybe the room was eighteen feet square. An enormous four-poster bed, discreetly curtained and festooned with blue beads, took up most of one wall, another had a long trestled table laden with china and glass dishes, even lids of biscuit boxes, all filled with dates, dried figs, nuts of all kinds and sugared strips of pink melon dripping nectar.

A tiny kitchen table stood in the empty middle of the room, laid for two with my own silver, glass and linen. Odd chairs were ranged, touching, round every scrap of wall. Some looked very familiar. One, at least, was my own particular sketching chair.

As soon as we arrived wreaths of marigolds and orange blossom were thrown over our heads, and we were salaamed to the table. The rest of the guests filed in after us, crowded all the wall seats, and piled four deep on the bed, stiff in mannered silence. The small bride looked perfectly hideous weeping in her corner, with scarlet eyelids and swollen nose. Except a rustle as some fidgetted, there was no sound in the room but her strangled gulps. The guests were much too shy to talk in our presence. They simply stared and stared.

The bridegroom waited on us as usual, wearing trousers much too long for him, that looked horribly familiar to my tall sahib, and served us with dressed radish and celeriac, dhal soup, tinned tunney, roast bazaar chicken (a ghastly stringy thing of ancient lineage), a delicious salad of green figs, pink melon and cumquats, and beautiful strong thick coffee. We ate just as in a play, throwing an occasional word to the bridegroom, and talking in hysterical asides to each other, as the room got hotter and hotter. Just about forty native friends piled round the walls, and forty pairs of gimlet eyes were fixed on us to see how sahibs eat.

Bit by bit we shed all garments possible, but, even so, simmered in a Turkish bath.

At last I sprang to my feet, and told Sharman we could eat no more alone. He must serve coffee and fruit to his other guests.

A perfect hubbub ensued as all ate. The table was taken out, a foul oil lamp added its reek to that thick atmosphere. Sharman disappeared to anoint his black curls anew with perfumed oil, the childish bride was given a clean handkerchief in place of the sodden ball in her clumsy fingers.

The conductor's baton was raised for the overture to begin!

Inevitable small boys charged madly up the stairs, shrieking that the priests were approaching. We all made a rough circle and a gorgeous group appeared with much clashing of cymbals and swinging of censers.

The lamp went out, torchlight alone shone in the room. The bearded jewelled priests stood out against the black walls and crowded guests behind them. Wreaths of blue incense drifted across the brilliant group in an atmosphere you could cut with a knife. Down on the floor, between the priest and the bridal pair, lost in the shadows of the crowd, squatted a tiny naked boy of two, blindfolded and still. Sharman's good-looking married sister murmured to me in French that he represented the son Sharman hoped would soon be his.

"Where have you come from, Baby dear?"
"Out of the Nowhere into Here."

All through the long ceremony I noticed the younger people of the crowd busy with stifled laughter, jabbing long sharp pins into both groom and bride. They took no notice, though some must have penetrated a good half inch. I found later that this was a test of their future happiness. Anyone grunting with pain would surely be unfaithful. Young brothers and sisters seemed to be paying off old scores.

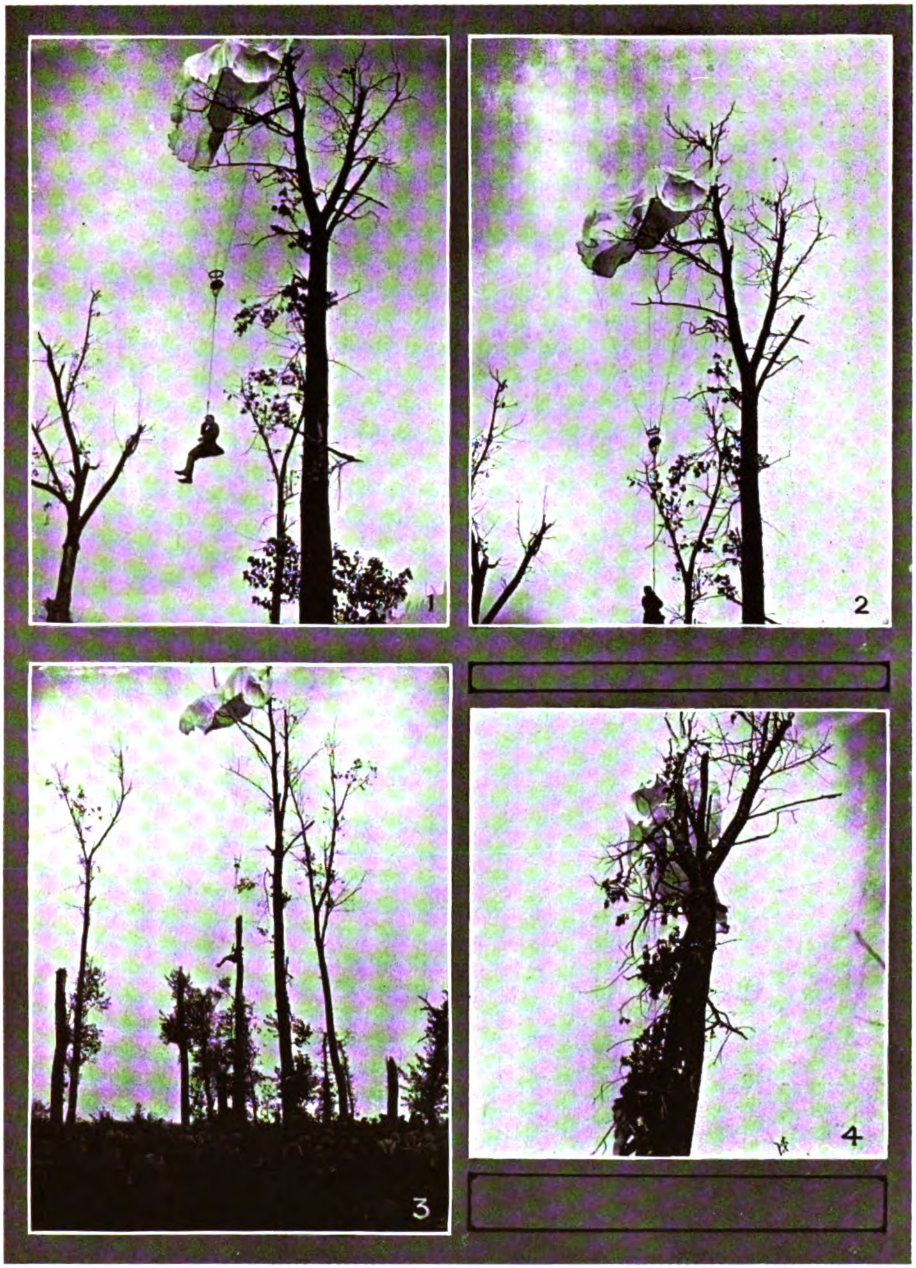
As soon as the priests withdrew, after making a record collection, we gathered from the laughter and tone of jokes about us that discretion was the better part of valour, and withdrew in good order, our shed garments borne like a Scots plaidie over our shoulders.

The night was too lovely for sleep. We drove slowly out to the club, found other stragglers there, and lounged for an idle hour on the roof, filling exhausted lungs with fresh oxygen, while we laughed over the ordeal of that dinner. A friend told us of a comic dinner party she once gave when she was a very new bride at Amritsar. They were very junior officers, and it was their first entertainment to the General, whom they wanted to impress. So every tiniest detail was rehearsed beforehand.

Not only did they borrow heavily for silver and plate from their neighbours, but, of course, every guest brought his or her bearer to wait upon them.

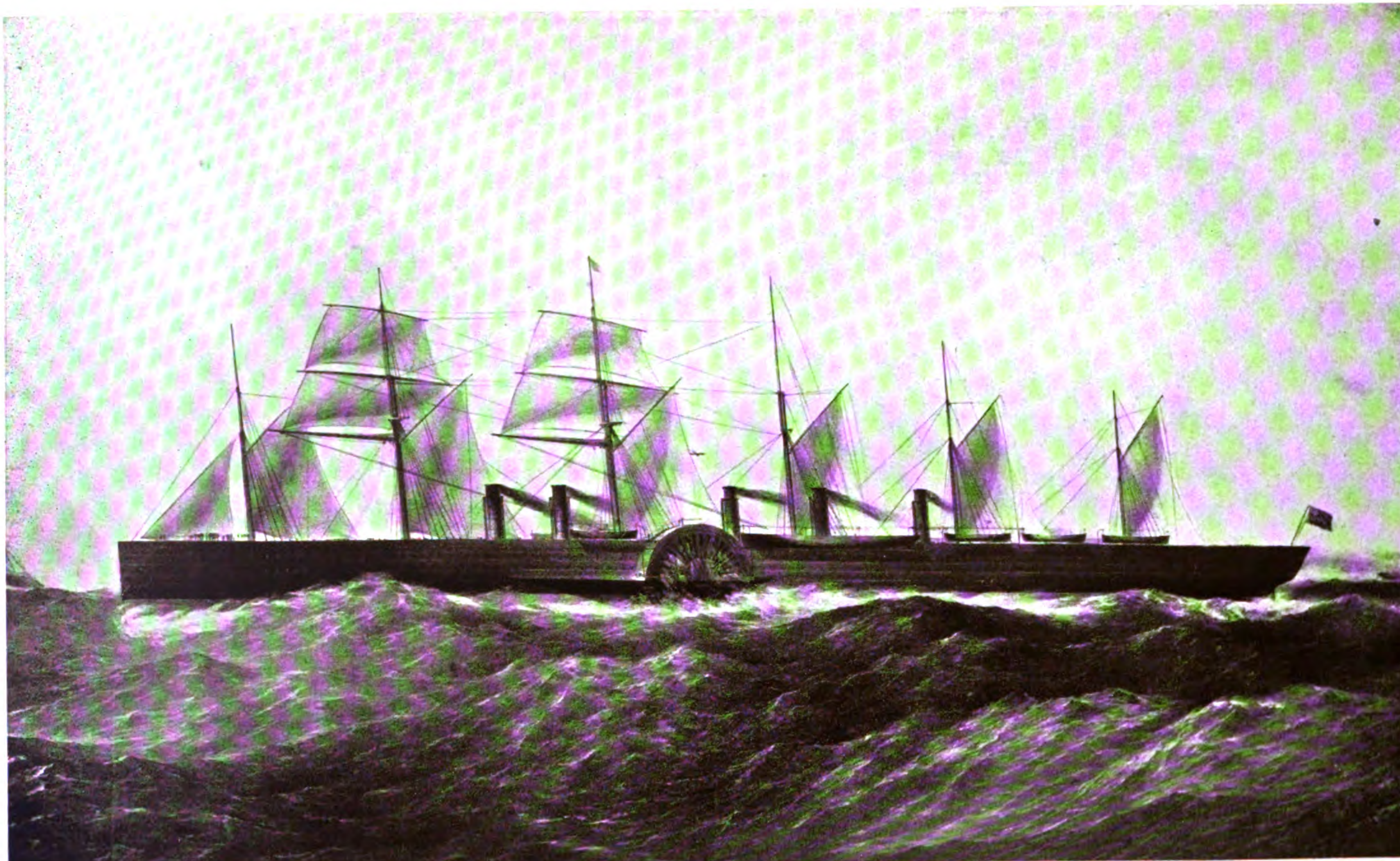
After the table was cleared, the proud turbaned bearers came in in a string, each carrying a salver for his sahib, as had been arranged. But as the hostess did *not* order, on each was a plate, a fingerbowl, and—a roll of toilet paper! The word " d'oyley " had been too much for their muddled brains, though obviously some dim connection of ideas had filtered through!

However, after the first paralysed moment such a gale of laughter went up from everyone, that the dinner was voted the success of the year, and is still talked about in the Punjab.



Early Days of Parachutes.

An episode during the first day of the Battle of the Menin Ridge, September, 1917 The parachute descent was made from an Observation Balloon which had been attacked and fired by enemy aircraft. No. 3 shows Australian troops coming to the rescue, one of whom can be seen climbing up the trunk of the tree.



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S.S. "Great Eastern"

THE S.S. "GREAT EASTERN"

THE following is a letter written by a passenger on board the s.s. *Great Eastern** on the occasion of her first voyage across the Atlantic:—

Steam Ship Great Eastern
at Sea 30th March
1867

MY DEAR LIZZIE,

You would I suppose receive my hurried few lines sent ashore by the Pilot the morning we sailed from Liverpool. Had I only known sooner that the Pilot was going to leave us so soon I would have sent you a longer letter, but it was only 5 minutes before he left the ship that I was made aware that it would be the only opportunity of sending letters ashore—I daresay you would see some account of the sad accident that occurred when we were weighing anchor by which one man was instantly killed and several others severely injured.

The men were sent to man the capstan to assist the engine which was scarcely powerful enough to bring the ship up to it against the strong breeze of wind that was blowing at the time and the tide that was running against us. Some of the *Palls* which hold the capstan broke after they had got a considerable strain on the anchor, and round it went like lightning sending the poor fellows flying in every direction. Those who had presence of mind to throw themselves down escaped without much injury, but the thing was so sudden that few could do so. I happened to be walking the deck not far from where it occurred and heard a passenger who had witnessed the accident cry out for the Doctor and that a number of men were killed, upon which I went up to the deck over the smoking saloon which overlooked the scene of the accident.

When I looked down, one of the passengers, a friend of some passenger not a passenger I hear, the Captain and some of the uninjured men were dragging out the wounded and dying men, when all of a sudden the capstan began flying round again. The passenger was struck down by

* "The s.s. *Great Eastern* was designed by Brunel and was put afloat on January 31st, 1858. The *Great Eastern*, the giant of its time (1869), had not only a screw propeller but paddle wheels and six masts for sails. She is perhaps the most discussed steamship and the most historical failure, but was one of the strongest ships ever built. She was specially designed to ply between England and either Calcutta or Colombo. She was subsequently purchased for use on the North Atlantic, a service for which she was not designed and was most unsuitable. She later performed excellent work in laying the Atlantic cable. The paddle engines indicated 3,411 h.p. while the screw engines which drove the four-bladed propeller indicated 4,886 h.p. She was 18,914 tons gross, her dimensions were 692 feet on the upper deck by 82.5 feet beam and 30 feet draught."—*Encyclopædia Britannica*, Fourteenth Edition.

one of the bars and the captain had a very narrow escape also and would no doubt have been killed or severely injured had he not thrown himself flat on the deck thus allowing the bars to fly harmlessly over him. Of course, there was the utmost alarm and consternation amongst the passengers and as it was thought impossible for us to sail that day a great number resolved to leave the ship and go by the Cunard steamer *Tripoli* which was ready to leave at the same time as the *Great Eastern*.

Capt. Anderson however was determined to leave and therefore slipped his anchor, leaving the Liverpool folks to fish it up from the bottom of the Mersey, and at 1 o'clock we slowly steamed down the river seawards. An immense concourse of people had collected to witness the big ship sail, the large floating piers being literally crammed with spectators. We were cheered from several steamers and ships but couldn't, under the depressing circumstances of our unlucky start, give one in return.

The dead man and two of those who were severely, and I fear mortally, injured were sent ashore in the Steam Tender. The rest remain on board and are doing well.

After the Pilot had left us a steamer was observed in chase and we came to a stand until she came alongside. Speculation was, of course, rife as to what or who she wanted but it turned out that it was merely the second Doctor who was sent ashore with the wounded men, and who had been sent after us from Liverpool in a fast boat. After taking them on board we proceeded, a heavy sea for the River running, a half gale of wind blowing almost dead ahead. The Ship steady as a rock and no noise or vibration from the engines. This state of matters continued until Wednesday night when we cleared the land. At 10 o'clock and just before turning in, a little motion was perceptible but nothing of any account, considering that we were fairly out at sea. During the night however the ship rolled like a washing tub and the noise and racket on board was something dreadful. In the Grand Saloon close to my berth the whole of the furniture including the Piano got adrift and tumbled from one side to another. The lamps flew out of the chandeliers in all directions while in our dark cabins things went flying about in an alarming way. It was impossible as well as highly dangerous to attempt getting on deck so there was nothing for it but patience till day dawned. In other parts of the ship the row was even worse than in the Grand Saloon and the amount of breakage of crockery and glass must have been something extraordinary.

On getting safely on deck next morning I was surprised to find that there was very little wind and, as I thought, not a very heavy sea but yet the ship was rolling so awfully that it was almost impossible to walk the deck. The Captain got sail on her with a view of making her more steady, but the rags that she carries have as much effect as about 4 or 5 of my pocket handkerchiefs would on a 500 ton ship. There was only an indifferent muster at breakfast on Thursday morning—the din of glass and crockery adrift was something to remember. On getting on deck after breakfast the weather looked bad and about 12 o'clock a squall from the N.W. as we thought, but in reality an honest equinocial gale, struck us and of course made her roll worse than ever. The sails were soon all flying about having been fairly blown out of their fastenings and were with very great difficulty clewed up. The Captain had to alter his course several points to ease the ship and we had to go dead slow.

The gale lasted until this morning and we are now slipping through the water at the rate of 12 knots an hour. The passengers are as a rule awfully disgusted with the ship but I imagine they expected too much. Had they been in a smaller vessel during Thursday they would likely have been much more uncomfortable, for although we rolled extremely we never shipped a gallon of water, and although I am no great sailor I have never been off the deck during the day and never absent from a meal, and, what is more extraordinary still, doing my baccy steadily. The passengers look upon me as an old salt and some of the Yankee swells call me "*Capting*" so don't be surprised should I come back a "*General.*"

I cannot report favourably on the cooking department, and the attendance is simply very bad, but then great allowance must be made in a ship that was sent to sea before she should have been, with a lot of Frenchmen at the head of the Victualling Department all or nearly all of whom were sea sick. Then again locomotion has been extremely difficult, several passengers and some of the crew having been hurt by having been sent flying from one side of the ship to the other, when taking a heavy roll. They will have to change their cooks however before English stomachs are satisfied, as their French dishes don't go down at all and worse with the Yankees than ourselves.

She certainly is a wonderful craft but much too large for my taste. Everything is on such a gigantic scale that ordinary men seem powerless to prevent things taking their own course. On the whole I would prefer being in a 1500 ton ship when there was any real danger. One thing she has not enough dead weight in her this trip. They should have taken in 12,000 tons of coal but only have 7,000, and these are disappearing at the rate of, I suppose, 3 to 350 tons per day, and therefore we are gradually getting into worse trim.

The cabins are very good. I have one all to myself there being, I suppose, 20 berths for every passenger on board. The Saloons are of course magnificent, the one I am now sitting in being not very unlike the Grand Saloon in the Hotel de Louvre in Marseilles, if you remember what it is like. The dining saloons are also very spacious and lofty. There are 4 tables in breadth with ample room for serving between each.

The engines I need scarcely say are enormous pieces of mechanism and are worth travelling 1,000 miles to see.

There goes the bugle for dinner so I must close and take up the thread of my discourse some other day. We have not made any very good run yet. They are as follows, viz.:—

1st 24 hours.	240 Miles, off Queenstown.
2nd 24 hours.	245 Miles 170 W. of "Fastnet."
3rd 24 hours.	153 miles 323 W. of "Fastnet."
4th 24 hours.	227 Miles 550 W. of "Fastnet."

MONDAY, 1ST APRIL.

Weather since Saturday has been, and still continues, more moderate and our progress therefore has been somewhat better; run from noon Saturday till noon yesterday 255 miles, and I imagine noon to-day will add 270 or 280 to the score and will thus bring us to within 100 miles of the half-way point if not a little under that distance. Should the

weather continue as favourable as it is, I think there is little doubt of us reaching New York on Sunday next or this day week at latest. This will be a long passage, but considering that they have been unable to work either the Screw or Paddle Engines much over half power it will not be so bad after all.

Yesterday we had Prayers in the Grand Dining Saloon in which there is a very nice harmonium. The morning Hymn and the old hundred were sung very well, but an Anthem Voluntary was murdered awfully. They should not try these sort of things on board ship without some little preparation.

Last night there was a bit of a scene in the Smoking Saloon in which there is a bar where liquor is sold to passengers. A party of 3 Indian Officers from the Bombay side have been *keeping it up* rather heavy since we sailed, and one of them got beastly drunk and was rolling about in the saloon when the Captain happened to look in and ordered him to be taken to his cabin and the bar closed. As the said drunken party was making his way below, I happened to be standing, finishing a weed before turning in for the night, at the door of the 'Companion,' he staggered up against me and instantly proposed that I should fight him. After a good deal of bother I proposed that instead of fighting we should adjourn to his cabin and have a 'peg.' The word 'peg' settled the matter and I got him down and into his berth without more trouble. He has not shewn face to-day and I suspect feels rather ashamed to do so.

We have two rather great men on board as passengers. One Mr. Cyrus Field to whose labors during the last 12 years we owe the success of laying and raising the means to lay the Atlantic cable. He is a Yankee but a very nice sort of man without any "bunkum" about him.* He and Sir James Anderson are of course great friends and both equally agreeable and unassuming in manner. The other notable is the renowned Gorilla hunter and traveller M. du Chaillu or, as we call him on board, the "small Gorilla."† He gave us a lecture on Saturday night about his travels in Africa but as he, being a Frenchman, has no command of the English language, it was not very interesting. He told us about some of the numerous tribes that he came in contact with and showed that the Institution called "Waterfalls" in America and "Bobs" in Glasgow were quite common amongst the African race but with this slight difference, that theirs were really their own *Wool.* I enclose a sketch of their mode of arrangement for Mary Ellen's benefit. She might cause quite a sensation in Buchanan Street with her head 3 parts shaved and a bob half a yard long sticking out behind her. From all accounts I hear on board Yankee Land is not by any means

* "Field, Cyrus West (1819-1892), American capitalist and projector of the first Atlantic cable. He and John W. Brett, his principal colleague, approached Sir Charles Bright in London, and in Dec., 1856, the Atlantic Telegraph Company was organized by them in Great Britain, a Government grant being secured of £14,000 annually for Government messages. After unsuccessful attempts to lay the cable in 1857 and again in June, 1858, the complete cable was laid between July and August, 1858, but in October the cable became useless, owing to the failure of its electrical installation. In July, 1866, a cable was laid and brought successfully into use."—*The Encyclopædia Britannica*, Fourteenth Edition.

† "Paul B. du Chaillu first found the gorilla in the Gabun in 1856. It was in 1865, in the middle Ogowé Country, that he definitely proved the existence of the Pigmy tribes. The popular reputation of the giant ape (*Gorilla gorilla*) is largely due to the writing of Paul B. du Chaillu in 1861 and later."—*The Encyclopædia Britannica*, Fourteenth Edition.

a very desirable place to live in. They are taxed within an inch of their lives. Mary Ellen would spend more for gloves in New York than it costs for her whole wardrobe and meat and *drink* in Glasgow, 2½ dollars being a common price for a pair. Boots—12 Dollars. Hats ditto, and a suit of decent clothes as much as 125 dols. or £25. I understand I shall have more duty to pay on the little things I have brought out as presents than the sum they originally cost in Glasgow which as the Yanks say " air a caution to snakes." With all their burdens however they seem to think they are much better off than any other people. One of the passengers told me in a sort of confidential manner that " He had for the most part seen all parts of the tarnal globe, that human nature was pretty much the same everywhere, and *no country like America* " ! !

SUNDAY, 7TH APRIL. NOON.

We are now within 360 miles of New York and hope to be off Sandy Hook to-morrow evening, but as the tide leaves at 2 p.m. there is no chance of getting up to the landing place until Tuesday. We shall thus have made a very long passage of it. The weather has certainly been very much against us. Strong head winds have prevailed with heavy cross seas. On Thursday 5th the temperature was exceedingly low, the sea being only 27 degrees, and we had therefore, to avoid ice, to run southward. On Friday there was a great change for the better. The thermometer went up about 20 degrees and the air was deliciously warm and balmy, but a strong wind prevailed and increased in force till time to turn in: at midnight the barometer began to fall rapidly and by 3 in the morning it was blowing a hurricane through which I contrived to sleep till 6 in the morning, when I was roused by finding myself almost standing on my head in my berth, the ship rolling fearfully and everything in my cabin adrift. I managed, after a good deal of trouble, to secure my trunks, etc., and then tried to get 40 winks more but it was no go; the ship rolled so fearfully that I found myself on my feet and head by turns in my bunk which is athwartship one and not fore and aft. At half past six I got up and with a good deal of trouble and tumbling about managed to get hold of the water can and put some water into the basin for a wash, but it was sent flying right and left by a tremendous roll, emptying the basin and filling my slippers. I threw on my clothes and hurried on deck. While making my way up a very heavy sea struck the ship, fairly stopped the engines for a time and nearly sent her on beam ends, carrying away 30 or 40 feet of her bulwarks, her forecastle deck, and forecastle companion. The water came rushing down to the cabins in every direction and the noise of it, together with the smashing of glass, crockery, furniture and floating wreck on deck, was something to be remembered but not easily described. The sea was fearfully heavy and to give you some idea of what the waves were I may mention that the ship's forecastle deck was about 35 feet from the level of the sea, the top of bulwarks another 5 or 6 feet above the deck—well the sea that we shipped was estimated to have flooded the forecastle to a depth of 12 feet. We took in between 4 & 500 tons of water principally down the forecastle hatchway or companion, which the sea as I said before had carried away. All this was bad as well could be, but worse than all several of the men on the

look out at the time were severely injured. One poor fellow has received a compound fracture of the thigh and his other leg was also broken. Two others were more or less injured but not dangerously. At the time of the accident the Captain was not on deck, having been up all night. He was called however and at once ordered the ship to be put about and run before the wind, which eased her very much and stopped the rolling to a great extent. After everything had been secured, and in the middle of quite a tropical shower, we were turned on our course again, the sea going down but still heavy and the rolling nearly as bad as before. About 1 p.m. another of the sailors was severely injured; during a heavy roll he was thrown down and came into contact with one of the ship's anchors which are stowed on deck forward. Several of the passengers also fell but escaped without being hurt. After noon the sea went gradually down and although we had a good deal of kicking about during the night the weather was on the whole improving and to-day is splendid. Had I not experienced what I have, I would never have believed that any ship, and least of all this one, could have rolled to the extent she does. As a set off to her rolling however, I may state that in the heaviest sea she pitches little or none. We have had concerts and lectures every alternate night since I last wrote, but with the exception of one night, when the Captain gave us a lecture on the Atlantic cable, nothing very good or interesting. Last night was no exception although, not 12 hours before, most people on board, I should imagine, were thinking of something very much more serious. Of course there was not much danger, as what would send some ships to the bottom is never felt in this huge vessel. For all this I must confess that I have had enough of the big ship and prefer trusting my life in one of the Cunard ships on my return. Everything on board is too unwieldy and big for ordinary mortals to manage and have under control, and were anything serious to happen to her, very few, I feel persuaded, would live to tell the tale. A steamer which left New York yesterday is just passing so I must go up and have a look at her. Will close this to-morrow.

We have had service on board this morning and are to have it again with a sermon this evening at 8 o'clock. I have kept exceedingly well —never missed a meal and have done my baccy as regular as clock work in all weathers, much to the admiration of the great bulk of the passengers who have with rare exceptions been more or less ill. The poor ladies have had a sad time of it and I thank my stars I had none of *my women folk* to look after, as the noise and racket have been dreadful and more alarming to them than the real danger. We had one lady in hysterics for several hours yesterday and I can tell you some of the men looked very like following suit at one time.

MONDAY MORNING.

We are now going through the water faster than ever we have done since leaving the Mersey, the weather being very fine but cold.

I have just come down from witnessing the funeral of the poor fellow who was so severely hurt on Saturday morning. He died at 2 o'clock this morning having been insensible for several hours before death. He must have sustained some internal injury or concussion of the brain

as he is said to have died of congestion of that organ. The Captain feels the loss of this poor fellow very much as he knows his friends and parents in Scotland. It was his first voyage, and the Captain had promised his Father to do all he could for him, little thinking how soon he would be called on to commit his remains to the deep. Such is life. Truly "in the midst of life we are in death." A funeral at sea is a most affecting sight and there were a good many moist eyes this morning when the dull sullen splash struck the ears of the assembled crew and passengers. One weather beaten old passenger fairly sobbed like a child.

All the passengers are on deck straining their eyes to get a glimpse of the Pilot boat which we expect to sight almost every moment.

Although we have been running very fast all night there is no hope of landing to-night, as the tide serves at 2 o'clock. It is now half past 11 and I suppose we must have about 80 miles still to run.

I have almost made up my mind to return by one of the Cunard Mail steamers as the passage from Canada is considered very dangerous at this season on account of the ice. It will be more expensive but that is nothing compared to the safety. I shall probably, however, be short enough of cash and think you had better send me a £10 Bank of England note by the first mail after you receive this. You might register it and address to me at the Saint Dennis Hotel, New York, where I intend staying the short time I remain in that City. I should not have required it, but my trip to Keighley, the duty I shall have to pay on the presents, and the extra fare by the Cunard boat, have put me out of my reckoning a little.

I hope you will have received some remittances from Thomson before this reaches you. It is quite possible I shall have enough but it wouldn't do to find I was short when I wanted to leave New York.

If I do not put up or cannot get a room at the St. Dennis, I think I shall have plenty of time to add a few lines to this after landing. The mail leaves, I believe, *Boston* on Wednesday so that this will have to be posted very soon after landing to be in time to catch her at that Port. I have made the acquaintance of a very nice young fellow called Poynter who is a manufacturing chemist in Glasgow. He is taking out an Aunt of his and will probably return before me, in which case he will either call on you or drop you a few lines on his arrival home. The mail steamer leaves New York on the 17th May and I shall return by her at latest, but will let you know my arrangements by the next opportunity. Passages are rather in demand on account of the Exhibition, and as our long and unfortunate run may deter many from returning by this ship, there will probably be a run on the Cunard boats, but I will see about a passage as soon as I land.

I trust my dear wife that you and all our dear ones are well and that Willie has quite got over his Rheumatism for a time, if not for good. You would no doubt be disappointed at not seeing our arrival announced in this morning's Herald and will be more so when to-morrow's does not contain it. Wednesday's, I imagine, will put all right or perhaps Tuesday's evening Citizen, as we shall likely be signalled about dark to-night and telegraphed at once, and the news should reach old England early to-morrow morning even allowing for the 5 hours difference in time, which is of course against us, it being nearly noon here now but 5 in the afternoon with you.

New York. Tuesday Afternoon.

We got up here at about 1 o'clock this afternoon and have just secured rooms in the St. Dennis Hotel, Broadway. This has to be posted " ek dum " as the mail closes at 6 o'clock and it is now nearly 5. I will write again to-morrow or next day before leaving for Youngstown. Glasgow must be very cold compared to this place. To-day is like a cold weathér day in Calcutta so I *guess* it will be smoking hot in June and July.

It seems a very busy go-ahead city and you can't look at any body or open your mouth for less than a dollar. God bless you all my dear ones.

Yours affectly
Peter Nicholls

ROYAL AIR FORCE

THE KING
Chief of the Royal Air Force.

AIR COUNCIL.

Secretary of State for Air (President of the Air Council):
Brigadier-General The Right Hon. Lord Thomson, P.C., C.B.E., D.S.O., *p.s.c.*

Under-Secretary of State for Air (Vice-President of the Air Council):
F. Montague, Esq., M.P.

Chief of the Air Staff:
Air Chief-Marshal Sir John M. Salmond, K.C.B., C.M.G., C.V.O., D.S.O.

Air Member for Personnel:
Air Vice-Marshal T. I. Webb-Bowen, C.B., C.M.G.

Air Member for Supply and Research:
Air-Marshal Sir John F. A. Higgins, K.C.B., K.B.E., D.S.O., A.F.C.

Deputy Chief of the Air Staff (Additional Member):
Air Vice-Marshal C. L. N. Newall, C.B., C.M.G., C.B.E., A.M.

Secretary of the Air Ministry:
Sir Walter F. Nicholson, K.C.B.

R.A.F. COMMANDS (HOME).

Air Defence of Great Britain.

Headquarters: Hillingdon House, Uxbridge, Middlesex.
Air Officer Commanding in Chief: Air-Marshal Sir Edward L. Ellington, K.C.B., C.M.G., C.B.E., *p.s.c.*, A.D.C.

Wessex Bombing Area.

Headquarters: Andover, Hants.
Air Officer Commanding: Air Vice-Marshal Sir John M. Steel, K.B.E., C.B., C.M.G.

Fighting Area.

Headquarters: Hillingdon House, Uxbridge, Middlesex.
Air Officer Commanding: Air Vice-Marshal H. C. T. Dowding, C.B., C.M.G., *p.s.c.*

No. 1 Air Defence Group.

Headquarters: 145, Sloane Street, Sloane Square, London, S.W.1.
Air Officer Commanding: Air-Commodore W. F. McNeece Foster, C.B.E., D.S.O., D.F.C.

Inland Area.

Headquarters: Bentley Priory, Stanmore, Middlesex.
Air Officer Commanding: Air Vice-Marshal A. E. Borton, C.B., C.M.G., D.S.O., A.F.C.

No. 21 *Group* (*Stores and Depot*).

Headquarters : West Drayton, Middlesex.
Officer Commanding : Group-Capt. L. W. B Rees, V.C., O.B.E., M.C., A.F.C., A.D.C.

No. 22 *Group* (*Army Co-operation*).

Headquarters : South Farnborough, Hants.
Air Officer Commanding : Air-Commodore N. D. K. MacEwen, C.M.G., D.S.O.

No. 23 *Group* (*Flying Training*).

Headquarters : St. Vincents, Grantham, Lincs
Air Officer Commanding : Air-Commodore P. B. Joubert de la Ferte, C.M.G., D.S.O., *p.s.a.*

COASTAL AREA (FLEET AIR ARM AND NAVAL CO-OPERATION).

Headquarters : 33-34, Tavistock Place, London, W.C.1.
Air Officer Commanding : Air Vice-Marshal C. L. Lambe, C.B., C.M.G., D.S.O.

No. 10 *Group* (*Naval Co-operation*).

Headquarters : Lee-on-Solent, Hants.
Air Officer Commanding : Air-Commodore A. W. Bigsworth, C.M.G., D.S.O., A.F.C.

ROYAL AIR FORCE COLLEGE, CRANWELL.

Headquarters : Cranwell, Lincs.
Commandant : Air Vice-Marshal A. M. Longmore, C.B., D.S.O., *q.s.*

ROYAL AIR FORCE, HALTON (SCHOOL OF AIRCRAFT APPRENTICES).

Headquarters : Halton Camp, Bucks.
Air Officer Commanding : Air-Commodore I. M. Bonham-Carter, C.B., O.B.E.

ROYAL AIR FORCE STAFF COLLEGE.

Headquarters : Andover, Hants.
Commandant : Air-Commodore E. R. Ludlow-Hewitt, C.B., C.M.G., D.S.O., M.C., *p.s.a.*

R.A.F. COMMANDS (OVERSEAS).

ROYAL AIR FORCE, MIDDLE EAST.

Headquarters : Villa Victoria, Cairo.
Air Officer Commanding : Air Vice-Marshal F. R. Scarlett, C.B., D.S.O.

Transjordan and Palestine.

Headquarters : Amman (moved to Customs House, Jerusalem, temporarily).
Air Officer Commanding : Air-Commodore P. H. L. Playfair, M.C.

IRAQ COMMAND.

Headquarters : Hinaidi, Iraq.
Air Officer Commanding : Air Vice-Marshal Sir Robert Brooke-Popham, K.C.B., C.M.G., D.S.O., A.F.C., *p.s.c.*

ROYAL AIR FORCE, INDIA.

Headquarters : Kelvin Grove, Simla.
Air Officer Commanding : Air-Marshal Sir W. Geoffrey H. Salmond, K.C.B., K.C.M.G., D.S.O., *p.s.c.*

No. 1 (*Indian*) *Group.*

Headquarters : Peshawar, India.
Officer Commanding : Group-Captain H. Le M. Brock, D.S.O., *p.s.a.*

No. 3 (*Indian*) *Wing.*

Headquarters : Quetta, India.
Officer Commanding : Wing-Commander J. O. Archer, C.B.E.

ROYAL AIR FORCE, MEDITERRANEAN.

Headquarters : Valletta, Malta.
Air Officer Commanding : Air-Commodore J. L. Forbes, O.B.E.

ADEN COMMAND.

Headquarters : Steamer Point, Aden.
Officer Commanding : Group-Captain C. T. Maclean, D.S.O., M.C.

Far East Command.

Headquarters : Singapore, Straits Settlements.
Officer Commanding : Group-Capt. H. M. Cave-Browne-Cave, D.S.O., D.F.C.

AIR ATTACHES TO EMBASSIES AND LEGATIONS.

Headquarters.	*Accredited to.*	*Name and Rank.*
Paris	Paris, Belgium, Holland	Group Captain R. J. Bone, C.B.E., D.S.O.
Washington ...	U.S.A.	Wing-Commander the Hon. L. J. E. Twistleton-Wykeham-Fiennes.
Rome	Italy, Greece.	Group Captain C. R. S. Bradley, O.B.E.
Buenos Aires ...	Argentine, Brazil, Chile, Uruguay.	Wing-Commander E. H. Johnston, O.B.E., D.F.C.
Berlin	Germany, Norway, Sweden, Denmark.	Group Captain E. L. Gossage, D.S.O., M.C., *q.s.*

DOMINION LIAISON OFFICERS.

Australia.—Flight-Lieutenant W. Palstra, M.C., *p.s.a.*, Room 523 Australia House, Strand, London, W.C.2.

Canada.—Squadron-Leader A. B. Shearer, Air Ministry, Adastral House, Kingsway, London, W.C.2.

New Zealand.—Squadron-Leader T. M. Wilkes, M.C., Air Ministry, Adastral House, Kingsway, London, W.C.2.

APPOINTMENTS.

The undermentioned postings of senior R.A.F. Officers have been promulgated from March 3rd to May 3rd, 1930:—

Rank and Name.	*To.*	*Date.*	*Remarks.*
Air Commodore.			
A. G. Board, C.M.G., D.S.O.	H.Q., R.A.F., Middle East	25/2/30	On ceasing to be attached to Station H.Q., Heliopolis, on completion of temporary duty with Cape—Cairo Flight, 1930.
Group Captains.			
A. Fletcher, C.M.G., C.B.E., M.C.	Half-pay List	7/4/30	On relinquishing appointment as Deputy Director of Organization.
H. M. Cave-Browne-Cave, D.S.O., D.F.C.	H.Q., Far East Command	1/1/30	On appointment as Officer Commanding.
C. D. Breese, A.F.C.	H.Q., Iraq Command	11/4/30	For Engineer Staff duties.
G. I. Carmichael, D.S.O., A.F.C.	H.Q., Iraq Command	2/3/30	Supernumerary. For special duty.
R. E. C. Peirse, D.S.O., A.F.C.	H.Q., R.A.F., Transjordan & Palestine.	12/3/30	Attached for special duty.

APPOINTMENTS—*continued.*

R. H. Verney, O.B.E.	R.A.F. Depot (I. Area)	22/3/30	Supernumerary. On transfer to Home Establishment.
L. A. Pattinson, D.S.O., M.C., D.F.C.	Air Ministry (D.O.S.D.)	7/5/30	On appointment as Deputy Director of Organization.
H. L. Reilly, D.S.O.	R.A.F. Depot (I. Area)	17/3/30	Supernumerary whilst attending Senior Officers' War Course at Royal Naval War College, Greenwich.
E. M. Murray, D.S.O., M.C.	Station H.Q., Heliopolis	29/3/30	On appointment as Officer Commanding.

TRAINING.

FLYING TRAINING.

During the period 1/3/30 to 31/5/30 the following completed courses at the Flying Training Units :—

Unit.	*Officers.*	*Airmen.*
No. 3 Flying Training School	28	5
No. 5 Flying Training School	2	—
Central Flying School (Flying Instructors' Course)	22	3

R.A.F. DISPLAY, MIDDLE EAST.

The Annual R.A.F. Display in Egypt was held at Heliopolis Aerodrome, Cairo, on March 3rd, 1930.

The Display was honoured by the attendance of H.M. King Fuad, His Excellency The High Commissioner, the Heads of all Diplomatic Missions in Egypt, and was witnessed by a very large number of spectators.

A feature of the Display was an exhibition of formation flying evolutions carried out by three Egyptian Army Officer pupils of No. 4 Flying Training School. These officers concluded their performance by a series of individual loops.

MAP READING COMPETITION FOR THE SASSOON CUP.

The final tests for the Sassoon Cup Map Reading Competition were carried out on March 27th, 1930. The results were as follows :—

1st	No. 29 Squadron	100% marks.
2nd	No. 43 Squadron	97% ,,
3rd	No. 32 Squadron	94% ,,
4th	No. 56 Squadron	92% ,,

The units competing for this cup comprise the squadrons of the Fighting Area of the Air Defence of Great Britain.

ARMY CO-OPERATION SQUADRONS.

During March and April individual training and the annual practice camps took place. The time devoted to air firing has been approximately doubled this year with a corresponding improvement in the results obtained.

Officers from the Staff College, Camberley, have been attached to army co-operation squadrons during May in order to obtain practical R.A.F. experience.

The usual R.A. practice camps opened in May, the squadrons co-operating with their affiliated artillery formations. A detachment of the School of Balloon Training is stationed at Transfyndd to provide observation, since no aeroplane landing ground is available this year. The Night Flying Flight is at Weston Zoyland in order to tow targets for the A.A. Practice Camp, Watchett.

Tests of mobilization equipment have been carried out by No. 13 (A.C.) Squadron in order to make a more prolonged trial than was possible in the short time available last autumn.

A number of Army staff exercises have been held in which R.A.F. staff officers have taken part.

AIRCRAFT CARRIERS.

H.M.S. *Hermes* carried out normal routine flying in conjunction with other ships on the China station.

H.M.S. *Eagle* carried out normal duty with the Mediterranean Fleet. Took part in the combined Exercises during the Spring Cruise.

H.M.S. *Argus* took part on the Spring Cruise with the Atlantic Fleet and also the combined Exercises. Arrived Portsmouth March 30th, 1930, and disembarked flights to R.A.F. Base, Gosport and Lee-on-Solent, since which her flights have been posted to H.M. Ships *Furious* and *Glorious*. Ship paid off at Devonport, May 7th, 1930.

H.M.S. *Furious* took part on the Spring Cruise with the Atlantic Fleet and also in the combined Exercises. Arrived Portsmouth, March 28th, 1930, and disembarked flights to R.A.F. Base, Gosport, since which four of her flights have been posted to H.M.S. *Glorious*. Engaged in the training of deck landing pilots since return to Home waters.

H.M.S. *Courageous* undergoing re-tubing at Devonport.

H.M.S. *Glorious* completed re-construction as an aircraft carrier in March, and carried out steaming trials successfully since which time she has been employed in giving pilots deck-landing practice flying. Leaves for Malta in June to join up with Mediterranean Fleet.

Overseas Commands

IRAQ.

Meeting between King Feisal of Iraq and Ibn Saud, King of the Hejaz and Nejd.

As a result of the meeting which took place on February 22nd on board H.M.S. *Lupin*, anchored outside the Shatt-el-Arab, the Kings undertook to attempt to settle the question of the establishment of certain Iraq Police Posts in the Southern Desert of Iraq within the following six months and, failing agreement, to refer the question to arbitration. The setting-up of a tribunal under the presidency of a British Political Officer in Koweit, to adjudicate upon claims for trans-frontier raiding was also agreed upon.

Raids by the Rowalla.

During March, a flight of No. 55 (B) Squadron was detached to Rutbah in order to co-operate with the Iraq Desert Police in the Wadian Area, who were engaged in the recovery of loot taken from Iraqi tribes by the Rowalla. After one or two minor demonstrations of hostility on the part of the Rowalla which were rendered abortive by the arrival of the aircraft, a patrol of police cars, accompanied by aircraft, visited the Rowalla camp, and impounded a sufficient number of camels to compensate the Iraqi tribes for the losses they had sustained. The impounded camels were driven to Rutbah, and handed over to the various claimants. Settlement of all outstanding claims between the Rowalla and Iraqi tribes has now been reached and the former have returned to their normal grazing areas in Syrian territory.

Reduction of Forces.

A further reduction of two sections of armoured cars was effected on April 1st. In consequence of this reduction from six sections to four, the Armoured Car Wing has now been designated No. 1 Armoured Car Company.

PALESTINE.

The situation in Palestine remains quiet. The bandit gangs in the Safed Area continued to give trouble for a time, but as a result of the operations directed against them, the gangs have broken up and have now ceased to have any significance.

TRANSJORDAN.

During March it became known that the Rowalla, a Syrian tribe, were in Transjordan territory on their annual northerly migration from Nejd and were in possession of camels looted from Transjordan tribes. A small force consisting of R.A.F. armoured cars and Transjordan Frontier Force left Amman on March 9th. The Rowalla were located on March 13th and as negotiations for the return of the looted camels proved unsatisfactory, a requisite number of camels were impounded and handed over to the civil authorities at Zerka for distibution to the tribes who had suffered in recent raids. Throughout the operations, aircraft of No. 14 (B) Squadron carried out reconnaissances for the column and Victoria aircraft from No. 216 (B) Squadron were employed as supply transport for the conveyance of the column's requirements.

Aircraft and armoured cars operating from Amman and Bair continue to patrol the southern and eastern frontiers of Transjordan. Successful operations have resulted in the interception of raiding parties and the dispositions of aircraft and armoured cars is proving a great deterrent to raiding by both Transjordan and Nejd tribes. All Transjordan tribes have now been withdrawn west of the line Bair—Jeffer—Tel Shahim, and with these greater distances and the continued action of aircraft and armoured cars it is hoped to put a stop to trans-frontier raiding.

Investigation into Transjordan—Nejd Raid Claims.

In order to carry out an investigation and report upon outstanding claims in respect of past raids between the tribes of Transjordan and Nejd, Mr. M. S. MacDonnell has proceeded to Jeddah, where a meeting with Ibn Saud will shortly take place.

SUDAN.

During April a certain amount of unrest was experienced in the region south of Malakal in the Upper Nile Province. A number of recalcitrant Gaweir Nuers had offered definite armed resistance to the Government tribal police and had taken refuge on the lower Zeraf Island, between the Rivers Zeraf and Jebel, in country inaccessible to ground troops. It was therefore decided to carry out an air reconnaissance of the affected area in order to locate the recalcitrants and to explore the possible approaches to their stronghold. Two aircraft of No. 47 (B) Squadron accordingly left Malakal and landed at Ajwong on April 23rd. Three reconnaissances, covering the whole of the area, were undertaken. A number of small camps were observed, but no large concentrations were visible and most of the area appeared to be uninhabitable. The best method of gaining access to the island was carefully explored and two possible points of entry from the east were observed, but access from Bahr-el-Jebel appeared to be extremely difficult. On the morning of April 24th a demonstration by the aircraft was made over the villages in the neighbourhood of Rufshendal, as these villages had been guilty of harbouring Pok, a much-wanted Kajur. The demonstration was completely successful and it was evident from their behaviour who were the guilty people. The reconnaissances undertaken revealed the fact that no difficulty is experienced in spotting even small concentrations of men in the swampy country in the Sudd area. As a result of the action taken it was decided to deal with the recalcitrants by the use of tribal police. The aircraft accordingly returned to Malakal on April 26th.

INDIA.

During April serious disturbances broke out on the North-West Frontier. Anti-Government feeling, actuated by hostile propaganda, appeared to be accountable for the general unrest amongst the tribes, particularly in the Mohmand country and the Peshawar District. As a result of the unrest in these localities, a number of reconnaissances by aircraft of No. 20 (A.C.) Squadron were carried out, during which the aircraft were heavily fired on on several occasions while over Mohmand country. The situation for a time improved until early in May, when the continued presence of the Haji of Turangzai near Shabkadr on the Mohmand border caused the Government to issue a warning to remove himself and his lashkar under pain of air action. The warning was ignored and aircraft of Nos. 20 and 27 Squadrons accordingly took offensive action, forcing Haji and his Bajaurs to vacate their caves. Several small parties were observed by air reconnaissances moving in a northerly direction to Bajaur. He was later reported to be in hiding in the Darba Khel and Ghalanai district. Harassing tactics by the aircraft were maintained and his positions subjected to air action on every occasion when targets presented themselves. Although the lashkar has not yet (May 29th) been dispersed, the morale of the rebels has been considerably shaken and the action taken has had the effect of deterring further Mohmand sections from participating. Air action against him is being continued.

Following an attack on the Datta Khel post by a lashkar of Wazirs numbering 500, air action was taken against them by the flight at Miranshah. As the lashkar failed to disperse, the villages of Datta Khel were subjected to air action, after the usual warning notices had been dropped. The result of the air action was immediate. The hostile lashkar was dispersed and the terms of our ultimatum to the Maliks were complied with within seven hours of its expiration. The Maliks presented themselves at Miranshah as hostages and Datta Khel is now occupied by Government forces.

ROYAL AUSTRALIAN AIR FORCE

THE KING.

Governor-General and Commander-in-Chief:
His Excellency the Right Hon. John Lawrence Baron Stonehaven, P.C., G.C.M.G., D.S.O.

Honorary Group Captain:
(Group-Captain, R.A.F.) His Royal Highness Albert Frederick Arthur George, Duke of York, K.G., P.C., K.T., G.C.M.G., G.C.V.O. (Personal A.D.C. to H.M. the King).

Air Aides-de-Camp to the Governor-General:
Wing-Commander R. S. Brown, A.F.C., *p.s.a.*
Wing-Commander L. J. Wackett, D.F.C., A.F.C., B.Sc., A.F.R.Ae.S., M.I.Ae.S. (Hons.).
Squadron-Leader R. J. Brownell, M.C., M.M.

THE DEPARTMENT OF DEFENCE.
Minister of State for Defence.
The Honorable Albert Ernest Green.

Secretary:
M. L. Shepherd, Esq., I.S.O.

Council of Defence:

Air Force Member	Air-Commodore R. Williams, C.B.E., D.S.O., *p.s.a.*
Assistant Secretary (Air Force)	Squadron-Leader T. F. W. Thompson, D.F.C., *p.s.a.*, R.A.F.

Defence Committee:

R.A.A.F. Representative ...	Air-Commodore R. Williams, C.B.E., D.S.O., *p.s.a.*, Chief of Air Staff.

Air Board:

Chief of the Air Staff	Air-Commodore R. Williams, C.B.E., D.S.O., *p.s.a.*
Air Member for Personnel ...	Group-Captain S. J. Goble, C.B.E., D.S.O., D.S.C., *p.s.a.*
Air Member for Supply	Wing-Commander W. H. Anderson, D.F.C., *p.s.a.*
Finance Member	A. C. Joyce, Esq., A.I.C.A.
Secretary	P. E. Coleman, Esq., O.B.E.

AIR FORCE HEADQUARTERS.
Branch of the Chief of the Air Staff:

Chief of the Air Staff	Air-Commodore R. Williams, C.B.E., D.S.O., *p.s.a.*
Director of Operations and Intelligence	Squadron-Leader T. F. W. Thompson, D.F.C., *p.s.a.*, R.A.F.
Director of Organization and Staff Duties	Flight-Lieutenant T. A. Swinbourne.
Director of Air Force Works and Buildings	Squadron-Leader A. Hepburn, D.F.C., C.E., A.M.I.E.

Branch of the Air Member for Personnel:

Air Member for Personnel ...	Group-Captain S. J. Goble, C.B.E., D.S.O., D.S.C., *p.s.a.*
Director of Training	Squadron-Leader W. D. Bostock, *p.s.a.*
Director of Personnel Services ...	Squadron-Leader R. J. Brownell, M.C., M.M., A.D.C.
Director of Manning	Flight-Lieutenant C. Eaton.
Deputy-Director of Medical Services (Air)	Wing-Commander A. P. Lawrence, M.C., M.B., B.S., F.R.C.S. (Edin.), D.O.M.S. (Lon.).

Branch of the Air Member for Supply:

Air Member for Supply	Wing Commander W. H. Anderson, D.F.C., *p.s.a.*
Director of Technical Equipment	Flight-Lieutenant G. J. W. Mackinolty.
Director of Equipment	Flight-Lieutenant J. F. S. Murray, M.B.E., M.C.
Director of Technical Services ...	Squadron-Leader H. C. Harrison.
Director of Aeronautical Inspection	Wing-Commander E. Harrison (acting).

LIAISON OFFICE, LONDON.

Liaison Officer	Flight-Lieutenant W. Palstra, M.C., B.A., *p.s.a.*
Assistant Liaison Officer ...	Flight-Lieutenant C. J. Harman.

NO. 1 FLYING TRAINING SCHOOL.

Point Cook, Victoria.

Commanding Officer ... ... Wing-Commander R. S. Brown, A.F.C., *p.s.a.*, A.D.C.

NO. 1 AIRCRAFT DEPOT.

Laverton, Victoria.

Commanding Officer ... ... Wing-Commander A. T. Cole, M.C., D.F.C., *p.s.a.*

NO. 1 SQUADRON.

Laverton, Victoria.

Commanding Officer ... ... Squadron-Leader F. W. F. Lukis.

NO. 3 SQUADRON.

Richmond, New South Wales.

Commanding Officer ... ... Squadron-Leader A. H. Cobby, D.S.O., D.F.C., *p.s.a.*

NO 101 FLIGHT.

Embarked in H.M.A.S. *Albatross.*

Commanding Officer ... ... Squadron-Leader V. R. Scriven, A.F.C., R.A.F.

IMPORTANT EVENTS CONNECTED WITH THE R.A.A.F.

The most outstanding event connected with the R.A.A.F. which has occurred recently was the visit of Air Chief-Marshal Sir John Salmond to Australia for the purpose of reporting to the Commonwealth Government on the organization, administration, and training of the R.A.A.F. This visit, combined with the visit to Australia of the R.A.F. Far-East Flight, the continuation of the scheme of exchange of officers between the R.A.F. and R.A.A.F., and the graduation of R.A.A.F. officers at the R.A.F. Staff College, has done much to maintain and strengthen

the close co-operation between the two Services. A similar close co-operation between the Air Council in London and the Australian Air Board has been maintained through the R.A.A.F. Liaison Officer in London.

Apart from the normal programme of service training carried out in units, much valuable work has been carried out by the R.A.A.F. in connection with air survey. Of such work the most important has been that on the Barrier Reef carried out in conjunction with the Royal Australian Navy; the photography of a number of selected areas for Army survey purposes; the survey of portions of Papua and of the Mandated Territories and an area of 600 square miles including the city of Sydney and its environs, of which a complete mosaic has been made. Much valuable reconnaissance work connected with forestry-fire patrols has been carried out, and a " Moth " aircraft, manned by R.A.A.F. officers, accompanied the British Australian Expedition in the *Discovery* to the Antarctic, where its reconnaissance work proved of considerable value to the expedition.

In pursuance of the policy of the Commonwealth Government to re-equip the R.A.A.F. with modern aircraft in place of the now-obsolescent aircraft presented by the Imperial Government in 1920, the Service landplane units have now been equipped with " Wapiti " and " Bulldog " aircraft, and the seaplane unit with " Southampton " flying boats. " Moth " aircraft have been adopted as the standard training aircraft in the R.A.A.F. with considerable success. The question of a replacement type of aircraft for the R.A.A.F. unit embarked in H.M.A.S. *Albatross* is now receiving consideration.

In accordance with the policy of the present Government, the system of recruiting personnel for service in the Citizen Air Force has been changed. The compulsory clauses of the Defence Act required every able-bodied male inhabitant of the Commonwealth to serve in the Defence Forces, and personnel for the Citizen Air Force were obtained by selection from volunteers coming forward for training under the Act. The compulsory clauses of the Act have been suspended, and service in the Defence Forces is now entirely voluntary—this system applies to the Citizen Air Force. Ample volunteers are forthcoming for service in the Citizen Air Force, and the change in the system of recruiting has been carried out without any detriment to the training and/or efficiency of these units.

NEW ZEALAND AIR FORCE

G.H.Q., Wellington.

Director of Air Services ...	Wing-Commander S. Grant-Dalton, D.S.O., A.F.C.

N.Z.A.F. Base, Auckland.

Officer Commanding	Squadron-Leader L. M. Isitt.
Instructor	Captain S. Wallingford.

Wigram Aerodrome, Christchurch.

Officer Commanding	Flight-Lieutenant M. W. Buckley.
Instructor	Flight-Lieutenant H. B. Burrell.
Equipment Officer	Flying-Officer T. J. Denton.

Duty with Royal Air Force.

Dominion Liaison Officer ...	Squadron-Leader T. M. Wilkes, M.C., Air Ministry, London.
Undergoing Courses	Squadron-Leader J. L. Findlay, M.C.

Anyone who has read the notes concerning the New Zealand Air Force published in previous issues of The Royal Air Force Quarterly will no doubt have come to the conclusion that the strength of this Force is such that there is plenty of room for expansion.

This is certainly true, and we may hope to see the steady growth of this branch of the Service during the next few years. As regards flying, the country offers a test for air pilotage as good as any.

This is all to the good, the result being that the pilots in this country have to be very thoroughly trained for rough-weather flying.

A crossing from one island to the other is always of interest from the flying point of view. Although the actual crossing of the Cook Strait can be cut down to fourteen miles at the narrowest part, yet it does not mean that there are possible landing grounds awaiting you on either side.

Proceeding south, one has to continue for another twenty miles over rugged hills and sounds, or round the coast until the Marlborough Plains are reached. Until then a forced landing would have to be carried out in the sea as near the cliffs as possible, there being no beach.

The same applies to the approaches to the North Island, the only possible landing ground being the Wellington Municipal Aerodrome at Rongatai, near Lyall Bay.

On a clear day the scenery displayed whilst crossing the Straits is magnificent, especially in the winter when the mountains are snow-capped.

From the Service point of view, the most interesting event has been the work carried out by Flight-Lieutenant Wallingford, in Samoa, who has contributed an interesting account of these operations to The Royal

Air Force Quarterly.* Owing to his absence in Samoa, Flight-Lieutenant Wallingford was unable to compete in the New Zealand Army Rifle Meeting. The New Zealand Air Force possesses another very excellent shot in Flying-Officer Denton. This officer was captain of the team representing the Headquarters Permanent Staff. Next year it is hoped to raise an Air Force team.

THE ROYAL CANADIAN AIR FORCE

Director of Air Services (Acting) Wing Commander L. S. Breadner, D.S.C., *p.s.a.*

R.C.A.F. Training Stations.

Camp Borden, Ontario:

Officer Commanding ... ... Wing Commander G. M. Croil, A.F.C., *p.s.a.*

Vancouver, British Columbia:

Officer Commanding ... ... Flight Lieutenant (temporary Squadron Leader) E. L. McLeod.

R.C.A.F. Communication Flight, Ottawa:

Officer in Charge ... ... (Attached to Ottawa Air Station).

Civil Government Air Operations.

Director ... ... Group Captain J. L. Gordon, D.F.C., A.D.C., *p.s.a.*

Stations:

Winnipeg Air Station, Manitoba:

Officer Commanding ... ... Squadron Leader N. R. Anderson, *p.s.a.*

High River Air Station, Alta.:

Officer Commanding ... ... Flight Lieutenant (Temporary Squadron Leader) A. A. Leitch, M.C., D.F.C.

Ottawa Air Station, Ontario:

Officer Commanding ... ... Flight Lieutenant (temporary Squadron Leader) R. S. Grandy.

Dartmouth Air Station, Nova Scotia:

Officer Commanding ... ...

No. 1 Depot, Ottawa, Ontario:

Officer Commanding ... ... Wing Commander W. R. Kenny, D.F.C., *q.s.*

Photographic Section, Ottawa, Ontario:

Officer Commanding ... ... Flight Lieutenant E. R. Owen.

Aeronautical Engineering.

Chief Aeronautical Engineer ... Group Captain E. W. Stedman, O.B.E.

Liaison Office, Air Ministry, London.

Liaison Officer ... ... Squadron Leader A. B. Shearer.

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* Ed. Note.—To be published in the October issue.

SOUTH AFRICAN AIR FORCE

AIR DIRECTORATE.

Headquarters	Roberts' Heights, Pretoria.
Director of Air Services ...	Colonel Sir H. A. van Ryneveld, K.B.E., D.S.O., M.C. S.A. Staff Corps.
Staff Officer	Lieut.-Colonel K. R. van der Spuy, M.C., S.A.A.F. (Attached S.A. Staff Corps).
Staff Officer (Air Equipment) ...	Lieut.-Colonel F. R. G. Hoare, C.B.E., S.A.O.C. (Attached S.A. Staff Corps).

NO. 1 FLYING TRAINING SCHOOL.

Headquarters	Zwartkop Air Station, Pretoria.

NO. 1 SQUADRON.

Headquarters	Zwartkop Air Station, Pretoria.

AIRCRAFT DEPOT.

Headquarters	Roberts' Heights, Pretoria.
Officer Commanding	Major J. Holthouse, O.B.E., S.A.A.F.
Adjutant	Lieutenant N. C. P. Mostert, S.A.A.F.

RESERVE AEROPLANE PARK.

Headquarters	Roberts' Heights, Pretoria.

TRANSVAAL UNIVERSITY COLLEGE AIR SQUADRON (ACTIVE CITIZEN FORCE).

Headquarters	Pretoria.

FOREIGN AIR FORCES

FRANCE.

The 1930 Budget has finally passed without any serious modification at 2,024,852,020 francs. This time the financial year begins on April 1st.

It was revealed in the course of the Budget discussions that the new West African Squadron will eventually be stationed at Gao on the Niger, where it will be in a good position to render assistance to the France—Congo Air Line due to begin working this year. It has been definitely stated by the French Air Minister that it is his policy to use Air Force units stationed in the Colonies to help on the civil air lines.

The work of getting ready the new Air Force station in Madagascar is progressing rapidly. The unit will probably consist of a squadron of general purpose aircraft and should be ready to operate this year. The unit will be stationed at Antananarivo.

ITALY.

Flight of two Squadrons to New York.

Preparations are being made for a flight by twelve Savoia S.55 flying boats to New York via the Azores next autumn. Commandante Maddalena will be in command, and it is understood that the portion of the route between the Azores and New York will be patrolled by two cruisers and six destroyers.

Air Display.

An Air Display was given by the Regia Aeronautica at the Littorio Aerodrome, Rome, on June 8th. This was the first display of its kind which has taken place in Italy, and the general lines of the programme were similar to those of the Annual R.A.F. Display.

GREECE.

The newly created Greek Air Ministry is functioning smoothly under the capable and energetic Under-Secretary of State, M. Zannas.

Captain Voulgaris, who was Director of the Naval Air Service, has been appointed Chief of the Air Staff, and Wing-Commander G. B. Dacre, D.S.O., R.A.F., who is a member of the British Naval Mission to Greece, has been appointed Air Adviser to the Air Ministry with the temporary rank of Group Captain.

UNITED STATES OF AMERICA.

Visit of the Battle Fleet and Aircraft Squadrons to East Coast.

Following the spring manœuvres earlier in the year, the United States Battle Fleet, including the three aircraft carriers—*Lexington*, *Saratoga* and *Langley*—visited Hampton Roads and New York.

Early in May the aircraft squadrons of the Battle Fleet carried out several long demonstration flights, during which Washington, New York and many of the larger cities and towns near the coast were visited. Never before have fleet aircraft in such numbers been seen on the East Coast, as the Battle Fleet is normally based at San Diego on the West Coast.

It is reported that over 130 aircraft from the carriers took part in these flights, the distribution being approximately as follows :—

	Carriers			
	Saratoga.	*Lexington.*	*Langley.*	*Total.*
Fighters	12	18	9	39
Torpedo Bombers	18	18	—	36
*Light Bombers	15	15	—	30
Scouting and Reconnaissance	9	9	6	24
Amphibian and Transport	3	1	—	4
Grand Total				133

Army Manœuvres on the West Coast.

The manœuvres took place on the West Coast in the southern part of the State of California during April, 1930.

Several interesting features were brought out during the manœuvre period :—

* Fighting aircraft classed as light bombers.

The air forces engaged were assumed to be acting as an independent fighting force unsupported by organized ground troops.

This was the first occasion on which all branches of the Air Corps were brought together for co-ordinated training, and it proved an invaluable opportunity to test the relative efficiency of all types of Service aircraft when operating together or in support of each other.

The number of aircraft operating totalled about 150, all types, and were flown from various parts of the States to the concentration station in California. Some excellent long-distance formation flights were carried out, among them being the following :—

(*a*) The Fighting Group, consisting of 40 fighting aircraft with 4 transport aircraft, flew together 4,300 miles, which included the flights to and from their home station at Selfridge Field.

(*b*) The Bombing Group of 19 twin-engined bombers and 1 transport, completed a total of 5,800 miles by the time the home station at Langley Field was reached.

(*c*) The Attack Group at Fort Crockett, Texas, consisting of 28 attack and 1 transport aircraft, flew together a total of 3,600 miles, while a mixed group, consisting of 20 fighters, 4 bombers and 2 transport aircraft, completed a 1,000-mile flight by the time they reached Rockwell Field, San Diego, their depot station.

The total mileage flown by all aircraft engaged in the manœuvres amounted to over 430,000, and was carried out without serious accident or delay.

According to the Press, the Air Corps Authorities are particularly impressed by the successful way in which the Air Force was maintained by its transport aircraft. All supplies, including complete engines in their crates, were carried by this means. Forced landings occurred to two aircraft through engine failure, and new engines were flown out in the transports and installed by Air Corps mechanics ; the damaged engines being conveyed by air to the concentration centre. A record of 97 per cent. operating efficiency was maintained throughout the manœuvre period, due, it is said, entirely to the success of the transport aircraft which were organized into transport squadrons.

It is reported that various new formations and tactics were tried out with success, among them being the following :—

(*a*) High formation flying. A squadron of fighters with full military load operated in formation at 25,000 ft.

(*b*) A squadron of bombing aircraft demonstrated an unusual formation said to give greater defensive measures, and also allow the rear gunners of each aircraft to bring greater concentration of fire in support of aircraft behind. The formation consisted of a " V " of 9 aircraft with the wide end of the formation closed by two of them. Instead of the aircraft being stepped up behind the leader in the usual way, each pair were lower than the pair in front, the leader being in the highest position of the formation.

(*c*) The Air Corps is said to have abandoned the method of attacking a bombing formation from below and to the rear, owing to the vulnerability of the attackers to gun fire from a formation such as that mentioned at (*b*) above.

Instead, a bombing formation is to be subjected to long-range harassing fire from fighters flying above and far to the rear, and at the same time diving attacks by fighters are to be delivered on the right and left front quarters of the bombing formation. It is claimed that this method of attack is much more effective than any other.

(*d*) The Air Corps has developed a special type of aeroplane for attacking ground forces, designated Attack aircraft. This type, a two-seater, armed with six machine guns, operates at a height between 50 and 100 ft. from the ground, and follows as far as possible, the contours of the country, which acts as cover. These aircraft were used during the manœuvres, not only for attacking lines of communication, etc., but also in connection with the convoying of bombing formations, the theory being that the Attack Squadrons could so harass enemy anti-aircraft fire as to render it ineffective. The bombers would also be escorted by high-flying fighting aircraft.

Lighter-than-air New All-Metal Airship proposed for the Army Air Corps.

It is understood that a bill has recently been introduced in the House of Representatives which will provide for a larger all-metal airship than that which the U.S. Navy Department is experimenting with at the present time.

The following details have already been released to the Press :—

The airship will be 547½ ft. long, with a maximum width of 119½ ft. and a gas capacity of approximately 3,800,000 cu. ft. The cost will be in the neighbourhood of 4½ million dollars (£900,000). Eight engines will form the power plant, and will develop 4,800 h.p., giving an estimated maximum speed of 100 m.p.h. The airship will weigh about 67½ tons, its useful load being estimated at nearly 90 tons.

It is to be equipped with 30,000 rounds of ammunition, one 37 mm. gun, from 2 to 7 tons of bombs, 2 aircraft, 10 machine guns, and a 1,000 watt searchlight.

It is doubtful whether this bill will get very far during the present session of Congress.

High Altitude Photography.

Captain W. A. Stevens, of the U.S. Army Air Corps, recently succeeded in taking a photograph covering 270 miles in a single exposure. The photograph was made during a flight at 20,000 ft. over Crater Lake, Oregon, and the result gives a remarkably clear picture of the various mountain ranges stretching away northward towards Mount Rainier, 14,000 ft. above the sea. The lens used in the camera perfected by Captain Stevens for long-distance photography is of a peculiar red, so deep in shade that to the naked eye the lens seems black. A special highly sensitive film is used on these occasions.

CIVIL AVIATION

AIR MAIL TO EGYPT, PALESTINE, IRAQ AND INDIA.

The through air service between the United Kingdom and India which, commenced on April 12th, permits a considerable acceleration of the air mail to all places on the route as compared with previous time tables.

Mails posted at the General Post Office before 0600 hours on Saturdays, or in the provinces at times which can be ascertained locally, will reach :—

Alexandria ...	On the following	Monday evening.
Gaza	„ „	Tuesday morning.
Baghdad	„ „	Tuesday evening.
Basra	„ „	Wednesday morning.
Karachi	„ „	Friday afternoon.
Delhi	„ „	Saturday evening.

In the homeward direction, the air mail will be due to leave Delhi on Monday and Karachi on Tuesday, and to arrive at Croydon on Monday evening.

The present air fees—in addition to the ordinary postage—are :—

To Egypt and Palestine	2d.	per ½ oz.
To Iraq	3½d.	„
To Persia	5d.	„
To Karachi	5d.	„
To Razmak and Quetta	5d.	„
To Delhi	7d.	„

CANADA:

Summary of Civil Aviation Certificates and Licences.

During the quarterly period, January 1st to March 31st, 1930, there have been issued 17 private licences, 19 commercial pilots' licences and 6 air engineers' licences; 6 aircraft have been registered and 1 air harbour licensed, bringing the total in force at March 31st, 1930, as follows :—

370 Private Pilots.	370 Commercial Pilots.
311 Air Engineers.	407 Aircraft.
71 Air Harbours.	

Light Aeroplane Clubs.

Seventeen Clubs were actively engaged in flying during the quarter. Cape Breton, Halifax, Granby, Moose Jaw, Edmonton and Victoria closed down on December 31st, 1929, for the winter.

The operations of Clubs during the quarter ending March 31st, 1930, are as follows :—

Clubs Operating	23
Flying Time	1,599 hrs. 02 mins.
Ab Initio Soloists	305
Licences obtained to date :—	
Private	318
Commercial	97

Commercial Operations.

On March 3rd, the Trans-Prairie Air Mail Service was officially established, operating from Calgary in the west, to Moose Jaw and Regina, from Edmonton to North Battleford to Saskatoon and Regina, and from Regina to Winnipeg. Ten aircraft cross and re-cross over the Prairie night and day on the route shaped like the letter " Y," covering over 2,500 miles every twenty-four hours. The most important centres in the Prairie Provinces are those linked by this chain. The mail flown by air to these centres will radiate outwards on the existing lines of communications so that the most remote sections of the Prairie will benefit by the fast air mail service.

During the quarter 1,710 hours were flown, a distance of 159,029 miles, 1,408 passengers, 131,187 pounds of express and freight, and 58,562 pounds of mail carried.

Air Mail.

The following is a summary of mail carried by air during the quarter ending March 31st, 1930 :—

1,059 trips were performed over these routes out of 1,332 trips scheduled. 148 were partially performed and 125 cancelled.

Total for quarter ending March 31st, 144,897 pounds.

Aerial Mineral Exploration in Northern Canada.

The building of the Hudson Bay Railway has exercised a remarkable influence in directing the attention of business men to the development of the natural resources of the region about Hudson Bay. Several Companies have been formed, backed by those interested in mining development in Canada to undertake mineral investigations in Northern Canada, commencing with the Hudson Bay area. These concerns include the Northern Aerial Minerals Exploration Company, Ltd., Dominion Explorers, Ltd., the Cyril Knight Company and the Nipissing Mining Corporation. Expeditions have been organized on a very large scale during the years 1928 and 1929.

The vast extent of the country involved may be judged from the fact that one portion, namely, the Keewatin District, has an area of over 200,000 square miles, about the size of France. The Arctic watershed included covers about 35,000 square miles.

The use of the aeroplane for transportation and investigation and of the wireless telephone for communication has swept back 1,000 miles into the north the boundary marking the generally accepted northern limit of natural resources capable of development. Country comparatively unknown hitherto has been carefully inspected from the air by trained experts, or studied in detail on the ground by prospectors fresh from the mining areas of Northern Ontario and Quebec. Never since the time of the " Franklin Search " has so much public attention been directed to Northern Canada.

The aeroplane first came into use in connection with mineral prospecting in the Red Lake area of Northern Ontario and the Rouyn field of Northern

Quebec, its main value then being in the field of transportation. Prospectors and geologists flying across country then began to find that the aerial view was of great assistance in their ground work. Rock exposures can be readily located and the general character of the rock can be ascertained from the appearance of the weathered surface. Sedimentary rocks can be distinguished from igneous, and light basic rocks from the dark acid ones. It can be noted if the formations have been disturbed by igneous intrusions or by structural bending and folding. On the ground it may be a difficult matter to trace the course of an intrusive dyke, while from the air it usually stands out as an unmistakable line across the country with characteristic topography and vegetation.

When aerial photographs are available, especially verticals which can be studied in relief with the stereoscope, the country may be broadly classified as "promising" or "unpromising" for the occurrence of minerals. The most useful function of the aeroplane in this connection is that of carrying a trained observer-geologist about the country, or of permitting the taking of photographs which may be studied by one.

The aeroplane is also used to transport parties with supplies and equipment to study areas selected as promising, and later on to carry any tools and equipment necessary for the preliminary investigation of a mineral discovery.

The experimental work during the past two or three years has made it possible to organize elaborate expeditions into the north country, and the experience gained during the past two years will be of great value in planning still more ambitious work during the next few seasons. Gasolene bases must be established and care taken to choose the right type of aeroplane fitted, according to the season of the year, either with pontoons or with skis. There is a period in the spring and fall during which pontoons must be used in the south, while skis are required in the north, owing to the earlier advent of winter freezing.

A great deal of interesting information relative to aerial mineral prospecting in Northern Canada is published by the North-West Territories and Yukon Branch of the Dominion Department of the Interior in a booklet just forwarded to the Acting High Commissioner for Canada in London. This booklet is entitled "Preliminary Report on the Aerial Mineral Exploration of Northern Canada," and copies are available for distribution on application to the Secretary, Office of the High Commissioner for Canada, The Canadian Building, Trafalgar Square, London, S.W.1.

Foreign Countries.

FRANCE.

The France—South America Air Line have made their first mail flight across the South Atlantic. Mail was delivered at Buenos Aires from France in three and a half days after leaving France. The return flight will take place immediately and it is proposed that the service shall then be operated weekly. Up to now the central portion of the journey from France to Buenos Aires, which consists of the Atlantic crossing, has been carried out by French Naval despatch boats lent by the Government.

Air Union Ligne d'Orient.

In connection with the establishment of the air route between Damascus and Baghdad a series of experimental flights, using Breguet aircraft were successfully carried out between December, 1929, and February, 1930. The Agreement governing the conditions under which the Iraq Government would sanction the operation of mail and passenger services was concluded in the first week in March.

The Damascus—Baghdad section of the Air Union Ligne d'Orient was opened on April 2nd. It now carries a weekly mail and such passengers as it can collect. Two aircraft are in service.

GERMANY.

Air Estimates, 1930-31.

The German Air Estimates for 1930-31 have been presented to the Budget Committee of the Reichstag, but are not yet passed. As drawn up they amount to a total of Rm45,977,550 (£2,298,880), compared with a total of Rm27,961,612 (£1,398,000) for last year. A supplementary estimate was however passed last year, bringing the amount to a total of Rm38,736,612 (£1,936,000).

The principal items in the Estimates are as stated below. For purposes of comparison, similar items of the previous financial year are given :—

	1930-31. Reichsmark.	1929-30. Reichsmark.
Technical Research and Development	5,445,000	14,505,000
Economic Development of Aircraft Industry	7,000,000	—
Development of Public Air Traffic by the Deutscher Luft Hansa :—		
(a) European Lines ...	16,000,000	13,000,000
(b) Non-European Lines	3,000,000	
Training of Civil Pilots ...	2,300,000	2,300,000
Development of Lighter-than-aircraft, including Grants to The Zeppelin Co.	3,150,000	2,500,000

SIAM.

How the Siamese are dealing with the lack of communications in Siam by the aid of the aeroplane is shown in the following notes :—

There is no such thing as civil aviation in Siam, all transportation of mails, etc., being carried out by the Army Air Service.

The north-eastern part of Siam has an area equal to about one-fifth of the whole kingdom and comprise the Provinces of Nagorn—Rajasima and Udorn with a population of about 3,200,000.

Owing to the lack of roads and railways in this area the chief means of transport is the bullock cart.

Nagorn—Rajasima is connected to Bangkok, the capital, by rail and extensions are being made to the railway towards the east and the north.

On account of these difficulties of communication in the north-east, the postal service is subject to delay and rapid transport of the sick requiring urgent medical attention could not be available by ordinary means.

The Siamese Government, realizing the need of more rapid communication in the north-east of Siam, established an aerodrome at Nagorn—Rajasima and three smaller ones at Roi-et, Ubol and Udorn in 1922 and 1923.

At the present time there are two air mail lines in operation :—

(1) Nagorn—Rajasima—Roi-et—Ubol (363 kilos).
(2) Nagorn—Rajasima—Roi-et—Udorn (431 kilos).

In addition to the ordinary aeroplanes used for the carriage of mails, sick persons wishing to receive medical treatment in Bangkok can hire ambulance aeroplanes which are kept at the various stations.

Poor persons in the North-Eastern Provinces are in urgent cases transported free of charge.

Before the air mail service was in operation in the North-Eastern Provinces, the dispatch of medicines and supplies was exceedingly slow. In consequence outbreaks of epidemic disease have frequently occurred.

The Department of Public Health made experiments whereby medical officers and supplies were sent by air which were highly successful, many lives being saved.

Since that time medical supplies for the prevention of epidemics have always been sent out by the Air Mail and serious outbreaks have been in many instances prevented, and the employment of aeroplanes in connection with medical work in a country like Siam, where the means of communication by land are still not fully developed, has proved extremely advantageous.

When the railway extension from Nagorn-Rajasima to Ubol is completed, the utility of the present air mail service between the two places via Roi-et will be lessened.

The Siamese Government have, therefore, decided to abolish this air route and to open a new one between Nagorn-Rajasima and Nagorn Bhanom via Rio-et.

UNITED STATES OF AMERICA.

On April 1st, 1930, there were 1,571 officially recognized landing grounds in the United States of America.

As at April 30th, 1930, there were 6,684 fully licensed aircraft and 2,943 " identified " (*i.e.*, awaiting a licence) aircraft in use in the United States, a total of 9,627 aircraft in civilian operation. On the same date 11,914 pilots' licences were valid, while mechanics' licences numbered 8,488.

On April 30th, 1930, there were 45,622 miles of United States airways, of which 27,667 miles were air mail routes ; in both these figures the mileage of American airways outside the United States are included. Daily aircraft mileage scheduled over these airways totalled 96,430 for all services, of which 50,433 miles were flown on air mail routes. On the air mail service the regularity of service for the first quarter of the year was 92.03 per cent. At the end of the year 1929 it is reported that nearly 15,000 miles of airways in the United States were lighted for night flying. Further equipment provided on these airways included the following :—Radio communication, teletype installations, and weather service. Intermediate landing fields are also provided on all air mail routes.

A MIXED GRILL FROM THE STATES

An American friend regularly sends me certain periodicals, marking particular paragraphs for my special attention, in order—as he puts it—that I may obtain the " inside dope" on how the United States are leading the world in aircraft matters.

Having some of these before me now, it occurs to me that they may not prove uninteresting to others connected with flying; in any case they give an insight into American methods of journalism.

* * *

The first article to catch my eye is one entitled, "Air Flivvers of the Future," by Roger Babson, appearing in *The Forum*.

This is not, as might be anticipated, an article on a type of aircraft likely to be suitable for mass production, but more a treatise on the economic situation of the industry in the U.S.A., and a forecast of the dangers of the " flivver-airplane."

The argument opens with a series of rhetorical questions :—

" If the activity of the automobile industry is all that is holding at bay the problem of unemployment, can we depend on this influence to continue? . . . Will the flivver-airplane carry on for us the prosperity which the flivver-car initiated?"

The writer concludes his diatribe with the following illuminating paragraph :—

" Twenty-five years ago an intoxicated man might tip the buggy over, but commonly the old horse would bring him home. To-day, a driver under the influence of liquor maims and kills. To-morrow, therefore, is something to ponder over. Without moral progress in pace with physical progress, the airplane will merely make dissipation and crime more efficient. As one result of the automobile has been to put hell on wheels, the airplane will put hell on wings. On the development of character depends whether the flivver-airplane shall bring prosperity or calamity."

The next blue-pencilled article before me is from *Popular Science*, entitled " Sky-Writer by Profession," written by Capt. O. C. Le Boutillier, who claims to originate from this side of the Atlantic, but who writes in the conversational style of the country of his adoption.

Here is an extract :—

" Speed! My little plane stands on a wing tip as I loop around a script 'I.' We always write on a flat plane, tho' the letters may look vertical from the ground. Would you believe I flew fifteen miles to make one letter? Now I've got to go back a couple of miles to dot an " i." That dot is as big as a city block. We write on a grand

scale, you know—with capital letters a mile long, generally. . . . There's the last letter done! All through, for better or worse. Now we'll dive a thousand feet and take a look at what we've written. The pilot has the worst view of anyone while he's writing. Looks pretty good. Well, there's a day's work done. Back to the field!"

The Scientific American provides the next theme of interest: "The Guns against the Airplane," by Major G. M. Barnes (described as a U.S. Ordnance Officer).

This article sets out to prove that although experience in the late war showed that five aeroplanes were destroyed by aircraft to every one brought down by gunfire, this ratio will be reversed in any future war. In fact, the writer seems to be of the opinion that electrically controlled guns can entirely nullify aircraft activity.

"The necessary firing data for the guns are computed automatically by the anti-aircraft director, a calculating machine which, if kept directed at the target by means of two telescopes, will not only continuously compute the range, speed, and course of the plane, but will also indicate continuously the elevation and direction at which the guns should be set so that they will point ahead of the target by the correct amount at all times. The gun must lead the target since the projectile requires several seconds to reach the plane. The calculating machine also allows for the direction and velocity of the wind, the muzzle velocity of the gun, and the density of the atmosphere at the time of fire.

"Now if the gun could be continuously trained, say electrically, to follow the data indicated by the director so that no time would be lost, the gun could keep step with the movements of the target. This has recently been accomplished. The new guns, electrically driven, follow the target. The other element entering into the problem—the time setting of the fuze to burst the shell at the proper point—also keeps step electrically with the calculations of the same instrument.

"More accurate fuses have also been developed.

"To those who doubt that the anti-aircraft gun has sufficient accuracy to combat aircraft, it may be of interest that the probability of bursting shells at a point near enough to the plane to be effective has been calculated, assuming no errors in laying the gun. Thus, at a range of say two and one half miles, if the gun is correctly laid continuously, the probability of a shot being effective is about 38 per cent.; at a range of four miles, 25 per cent. These percentages are for a three-inch gun, and would be greater for the four-inch gun. As the actual percentages now obtained are about one-fourth as much, here is an indication that future progress in fire control will result in increased accuracy, even though no other improvements be made in the gun or its ammunition."

The writer goes on to inform us:—

"A four-gun battery of three-inch guns will deliver an average of a hundred shots per minute. When the aviator sees the first burst, if at a range of approximately $2\frac{1}{2}$ miles from the battery, there will be more than sixteen shots already on the way toward the plane.

". . . From the advance which has already been made in anti-aircraft fire, it is safe to predict that anti-aircraft weapons of all types will become more and more effective as time passes."

The article concludes in a more moderate strain:—

"The writer does not contend that the airplane will be unable to take to the air, due to artillery fire. However, the prevalent idea that the airplane will, in future wars, ride roughshod over all existing defences unscathed will, as years go by, be forgotten, and the airplane, like the submarine, the tank, and the gun, will take its place as an important auxiliary tool in the complicated and ever-changing machinery of war."

Strangely enough, by the same post that brought *The Scientific American* arrived a periodical known as *The New Republic,* containing an article entitled "The Two-Hour War," by Stuart Chase. After reading both accounts one can only hope that the two authors read one another's works and then have an opportunity of meeting and discussing the more controversial points. A resultant combined article would provide fruitful reading.

In "The Two-Hour War" the writer bases all his calculations on a series of statements, which must be quoted before his conclusions can be fairly criticized:—

"On August 13, 1928, the 'Northern Power' opened its attack on London. Seventy-five airplanes, each carrying 500 pounds of 'bombs,' swooped down upon the city from the north-east. They were met by an equal number of defense planes, by batteries of anti-aircraft guns, by an extensive balloon system—by every known defense against an air attack. But within thirty minutes of crossing the coast-line, the defense planes had been eluded, the attack had centred directly over London, 'bombs' had been dropped on pre-determined targets, and the attacking force was wheeling back into the north without a casualty.

"Every specified objective was bombed. Fifty thousand pounds of theoretical explosives were dropped through 16,000 feet, with the accuracy of gun fire. Had these 22 tons of bombs been filled with diphenyl chloroarsine, half of the population of London, men, women, and children, would have been wiped out."

En passant, one should observe that to an American journalist anything is capable of quick description, whether there are any official facts available or not. In this case the writer, having "wetted his

public's appetite " for sensation, then proceeds to visualize a European War on the following lines :—

" Say that war is declared. In Bremen or Calais a thousand men climb into the cockpits of their aircraft. A starting signal, an hour or two of flight, a little veering, dropping and dodging, as the defense planes rise, a casualty or two as the radium atomite of the anti-aircraft guns tries vainly to fill a space 100 miles square and four miles deep, one muffled roar after another as the bombs are dropped per schedule and so, to all intents and purposes, the civilisation founded by William the Conqueror, which gave Bacon, Newton, and Watt to the world, comes, in something like half an hour, to a close. Finished and done, London, Liverpool, Manchester, Bristol—each now vanishes from the list of habitable places on the planet. Not even a rat, not even an ant, not even a roach, can survive; every living thing has ceased to breathe by virtue of diphenyl chloroarsine."

In four or five further paragraphs the writer disposes of all other fighting arms. He makes very short work of Major Barnes' anti-aircraft guns :—

" These bristling pictures of anti-aircraft guns in the Sunday supplements, together with accounts of their range and accuracy, are an insult to intelligence. The only way to keep airplanes out of a metropolitan area is to have enough anti-aircraft guns to fill 400 cubic miles practically solid with steel splinters and T.N.T. This would involve first, a fantastic number of guns, and second, grave discomfort for, if not the positive slaughter of, the metropolitan population, who could not move on the streets without umbrellas of heavy steel."

In the course of his writing it suddenly occurs to Mr. Chase that England may also have some aircraft; so :—

" The instant the thousand planes leave Hamburg [*sic*] for the cities of England, 1,500 planes leave London for Germany. Their ways may cross, but owing to the slipperiness of space and the haste of each squadron to be on its way, the casualties will be few, and the end of two civilisations, instead of one, not long delayed. As such things go, another ten minutes at the outside.

" There is one good thing to be said about the next war, it will not keep us on edge. We shall not have to worry about finding the money for Liberty Bonds, or wonder whether George is going to get his commission. The whole business will be over in a couple of hours. With lungs full of diphenyl chloroarsine, we shall not need to worry about anything ever again. Personally, though it may be contrary to the code of the sportsman, I know when I am beaten. And against a three-dimensional war-machine, I have no confidence of anything except that the unique association of electrons which comprises myself is about to form new and interesting chemical combinations."

As one reads on it becomes apparent that the writer is more anxious to impress his readers with the necessity for peace than to encourage his government to increase its power of air-attack. And in this hope he concludes the article :—

"The surviving West, together with the East, will then banish the machine from war—which means, of course, the banishment of war. Or so the conclusion hangs, neatly balanced between the hope and the belief, within the mind.".

From this we turn to a more technical article contained in *The North American Review,* under the caption of "The Windmill that Flies," by Donald F. Rose.

It contains a description of Cierva's Autogiro aeroplane, for which the writer forecasts a great commercial future. He says :—

"One of the most conservative American pilots has promised that within a few years—five at the most—an American business man will step into his Autogiro far out in the suburbs as nonchalantly as to-day he enters his waiting car. He will fly down to the city, alight on the roof of his own office building, and turn over his ship to an attendant to fly down to the city hangar. At evening the air will be filled with flying machines at levels regulated by traffic rules, taking their owners back again to their homes. With airplanes as they are to-day the picture is impossible. With a flying machine that can take its time, pick its perch, and be reasonable in its demands, it is not only possible but probable."

It will be observed that the average American writer, whatever his subject, is nothing if not optimistic. Cynical readers may find humour in the fact that Mr. D. F. Rose conducts the "Stuff and Nonsense Department" of *The North American Review.* In justice to him it must be said that he is also contributing editor to *Aero Digest.*

C. T.

AIRSHIP NOTES

GREAT BRITAIN.

R101.

Power Plant.—On a recent bench test, one of the 585 h.p. Beardmore compression ignition engines from R101 ran successfully for 225 hours at full rating, including 50 hours' continuous running. As the normal time test for a Service petrol engine consists of 98 hours at nine-tenths full power and two hours at full power, this test must be regarded as very satisfactory.

BOOK REVIEWS

AIRCRAFT INSTRUMENTS. By C. J. STEWART. (Chapman & Hall. Price 21s. net.)

The science of aeronautics is now showing such definite signs of its inevitable development that any authoritative publication dealing with one of these important phases is sure of a ready welcome. Major Stewart has been associated with the evolution and design of aeronautical instruments for many years, and his expert knowledge is now available in the form of a comprehensive and intensely interesting volume. Every branch of the subject is covered and the need for a standard English work is now supplied.

The work explains the design, construction, functioning and the fitting of aircraft instrument equipment, with a view to helping in the maintenance of flying safety and efficiency. A chapter on the automatic control is included, in order, as the author says, to emphasize the value of this aid to safety and comfort in the air.

It is only during the past few years that the importance of aircraft instruments has come to be generally realized, and all those engaged professionally in the design and use of aircraft and to those " whom pleasure and duty take into the air " will find this work invaluable to them. So far as the Service is concerned, one can rest assured that this book will be widely read and will doubtless be utilized as the text-book on the subject at all Service schools. Incidentally, one hopes that all Service libraries will have copies.

DEFINITIONS AND FORMULÆ FOR STUDENTS. FRIER. (Sir Isaac Pitman & Sons. Price 6d. net.)

This little booklet dealing with aeronautics is one of a series intended to provide students with all necessary definitions and formulæ in a convenient form. The combination of about two hundred definitions and a selection of the more important formulæ are given.

The author is careful to point out in his Preface that " a number of formulæ have had to be omitted because of their involved character " and that " there is no suggestion that the subject may in any sense be studied from a book of this kind; in general results only are given, and some previous knowledge on the part of the reader is assumed."

AIR POWER AND THE CITIES. J. M. SPAIGHT. (Longmans. Price 15s. net.)

The author discusses the question whether cities will be bombed in future wars, and, if so, whether they will suffer the cataclysmic disaster sometimes foretold. These questions, he points out, will not lose their

importance with the effective outlawry of war, for international air contingents may be used some day as an instrument for enforcing world peace. He asserts that the menace of air power and the menace of sea power, within its geographical limitations, are not essentially different. The logical starting point for such an inquiry is modern naval practice as exemplified in the bombardment of coastal towns, and sixteen such bombardments are examined in detail. The lesson of the bomb-falls in the late war is also considered, and some hitherto-unpublished particulars of the actual results of British raids into Germany in 1918 are given.

One is not altogether in agreement with Mr. Spaight's teachings, which are far too academic. To those who, as professional sailors, soldiers or airmen, have made a special study of war from the practical side as opposed to the purely academic or theoretical, some of the author's reasonings are hard to follow. It is to be feared that he is too much of the lawyer, and if wars could only be fought out in an International Court of Justice, Mr. Spaight's works would form an authoritative guide to its deliberations.

The winning of wars can be made to look a simple matter in theory, and most non-military writers are apt to let their imagination run riot. If they could be brought to think in terms of war and to realize that in war there are two opposing sides, they would at least modify their views. No! Mr. Spaight, we have an enemy to fight and we may be sure that this enemy is no fool and that he will possess adequate means and the directing brain to prevent us from attaining our object without some stiff fighting.

All this is not to imply that the professional sailor, soldier or airman has nothing to learn from Mr. Spaight's works. Far from it. Though we may not agree with all the author has to say, there is much we have learned from reading his books, which give one furiously to think, and "Air Power and the Cities" certainly provides ample food for thought.

Parachutes for Airmen. Charles Dixon. (Sir Isaac Pitman & Sons. Price 7s. 6d. net.)

This book is concerned with modern parachutes and parachuting, and, as the author rightly says in his Preface, "the time has come for the modern parachute to be widely recognized as a perfected safety device and not a crazy conception." Had the parachute of to-day been in existence during the war and standard equipment in the R.A.F., there is every justification for saying that hundreds of lives would have been saved. In those days, and indeed up to a few years ago, the parachute was looked upon as a crazy idea and was viewed, moreover, with disfavour by the Air Force. The reasons for this scepticism, or perhaps short-sightedness would not be too strong an expression, were that in war the parachute might undermine the fighting efficiency of the Air Force and be a strong incentive to many putting it to use prematurely. It was commonly believed that many of the parachute escapes made by German crews were unnecessarily premature, but this belief cannot generally be subscribed to. True, human nature being what it is, there are individuals who probably would make their escape prematurely, and

it is conceivable also that when an air force's *morale* was at an extremely low ebb, as might be the case when it had suffered severe casualties in air fighting, the parachute might prove an unmixed blessing. Despite such possible misuses, there can be no question but that the many valuable lives which would be saved " for a fight another day " would more than make up for any such possible misuses. The question also of adding to the weight (already heavy) of the equipment and therefore affecting adversely the performance of the aircraft, was a further factor against the use of the parachute, but this argument no longer holds good and it is doubtful even if this argument was really sound when dealing with war-time aircraft, for in any case some of the many useless " gadgets " could easily have been dispensed with to make way for something infinitely more useful. The utility of the parachute has since been so strikingly demonstrated that their war-value is no longer left in doubt.

The lives saved in the past two years, if measured in £ s. d., have shown a handsome return on the expenditure for this equipment. The decision to equip the Service with parachutes, in spite of the prejudice against their use known to be held by the majority of serving officers, must be credited to Lord Trenchard, who in this matter, as in most others, would appear to have used his better judgment.

The author of this book is to be congratulated on its timely publication and in presenting his subject in so interesting a manner. The book is exceedingly well illustrated.

THE LAW OF AVIATION. G. D. NOKES, LL.D., and H. P. BRIDGES, LL.D. (Chapman & Hall. Price 12s. 6d. net.)

This book is divided into two parts, which deal principally but not exclusively with the law of civil aviation in time of peace, and the law of combatant aviation in time of war.

Part I sets out in a concise and readable form the effect of the numerous international conventions, British Acts of Parliaments, statutory rules and orders, and departmental directions, which govern civil aviation in time of peace; together with many of the rules on similar points affecting the Royal Air Force; and also deals with the English law on such matters as trespass and nuisance by both civil and Service aircraft.

Part II, after referring to the regulation of civil aviation within Great Britain in time of war, discusses the international law governing air warfare, with particular reference to the rights of Service personnel. Finally, the position of civil air traffic in the vicinity of belligerents is considered.

In their Preface, the authors are at pains to point out that " recent experience shows that it is not easy to reach international agreement upon matters involving national defence; but one of the most urgent needs of the moment is international agreement upon the use of air power." All Air Staff Officers and those who aspire to such posts will do well to read this book—an authoritative treatise—and so equip themselves for the day when they will undoubtedly be faced with having to deal with the many intricate problems involved.

FLIGHTS OF NAVAL GENIUS. By BRIAN TUNSTALL, F.R.Hist.S. (Philip Allan. Price 12s. 6d.)

THE AYESHA: A GREAT ADVENTURE. By H. VON MUCKE. Edited, with an Account of the Adventures of the *Emden*, by J. G. LOCKHART. (Philip Allan. Price 7s. 6d.)

Both these books from the well-known house of Philip Allan are of absorbing interest. Mr. Tunstall deals with Admiral Earl Howe, Rodney, Sir Sidney Smith, Lord Camelford, and Sir Charles Napier, and is as vivacious in his narrative as he is accurate in his facts. When Howe was a decrepit old gentleman he rose from a bed of sickness at Bath to quell the mutiny at Spithead. Rodney was a gouty old bully of shocking bad temper and worse indigestion who broke the French line at the Saints and recaptured the mastery of the seas. Sidney Smith was the eccentric genius, half crusader, half emir, who quarrelled with Nelson, beat Napoleon at Acre, and signed a convention on his own responsibility, much to the annoyance of his superiors. Camelford was marooned by Vancouver, shot a brother officer dead, left the Navy in a huff, terrorized London, and was finally killed in a duel. Sir Charles Napier reached his prime in the peaceful years following the Napoleonic Wars, but managed, all the same, to find a life of adventure abroad well suited to his peculiar temperament. These biographical studies are written from original documents, and Mr. Tunstall has produced a thoroughly interesting book which sheds a new light on the private character of his subjects, and touches upon many unknown and neglected aspects of British naval history.

"The Ayesha" is the story of the almost incredible adventures of the landing party of fifty men from the *Emden* who found themselves left ashore at Cocos Keeling when their ship went to sea to meet her fate at the hands of the *Sydney*. Seizing the 97-ton schooner *Ayesha* lying in the anchorage, with no resources but the weapons they carried, they sailed from the island and reached Padang. Departing thence they were taken on board the German steamer *Choising*, and were eventually landed near Hodeida on the shore of the Red Sea. Partly on foot in the desert, partly sailing up the coast, and always in danger of death or capture, they finally reached the railway and travelled to Constantinople through Damascus and Aleppo. The story of their adventures and vicissitudes is truly a thrilling one.

SEA FIGHTS, 1914-18. Translated from PAUL CHACK'S "On Se Bat Sur Mer" by COMMANDER L. B. DENMAN, R.N. (Paper covers; 324 pages. Price 4s. 6d. Obtainable from Messrs. Simpkin Marshall, 4, Stationers Hall Court, E.C.4.)

The original of this work was written by Commandant Paul Chack, of the Historical Department of the French Admiralty, and in May, 1927, was awarded "Le Prix de la Renaissance," one of the highest literary prizes in France. The translation, printed at Liege, is the work of Commander L. B. Denman, and has been well and truly done. The book, described as an historical romance, deals with four comparatively little-known episodes of the war, and is picturesquely and interestingly

written. We are told the story of how a little French armed trawler, called the *Nord Caper*, with a crew of thirty, captured a Turkish schooner containing forty-three officers and men of the Ottoman Army without shedding a drop of blood. Next comes an account of the exploits of the German cruiser *Konigsberg*, her sinking of the British cruiser *Pegasus* off Zanzibar, the fighting at Dar-es-Salaam, and the final destruction of the raider while sheltering up the Rufigi River. Part III is the story of the Turkish attack upon the Suez Canal, and pays a tribute to the French seaplanes and French ships engaged in its defence. "Our seaplanes," the author asserts, "*alone served* as advanced scouts in Egypt, and made it possible for the British to organise the defence in time. And, on February 3rd, 1915, it was the guns of the *Réquin* and *D'Entrecasteaux* that held up the Turks, launched in assault upon the Suez Canal. Thus the greatest of French engineering achievements was saved by the French." At this late stage we need not trouble to contradict these somewhat sweeping statements, except to remind readers that British ships and aircraft, and British and Dominion and Indian and Egyptian troops also played a part in the defence of the Canal. The author is at his best in the final section when writing of the work in the Adriatic and the gallantry of the British drifters patrolling the Straits of Otranto. But the most thrilling part of the book is undoubtedly the story of the torpedoing and sinking of the Austrian battleship *Szent Istvan* by two small Italian motor-boats in June, 1918. The whole book is well worth reading if only to give an idea of how the incidents described are viewed through the eyes of a French naval officer who is also a talented writer, and both author and translator are to be congratulated on a piece of work that helps to keep alive the memory of rather a neglected aspect of the Allied comradeship in arms which existed afloat in 1914-18.

THE NAUTILUS LIBRARY. (Philip Allan & Co. Price 3s. 6d. each volume.)

1. "Mysteries of the Sea." By J. G. Lockhart.
2. "Seamen All." By E. Keble Chatterton.
3. "Peril of the Sea." By J. G. Lockhart.
4. "Sea Wolves of the Mediterranean." By E. Hamilton Currey.
5. "Sea Venturers of Britain." By "Taffrail."
6. "The Cruise of the *Alerte*." By E. F. Knight.
7. "The Story of H.M.S. *Victory*." By Geoffrey Callender.
8. "Strange Adventures of the Sea." By J. G. Lockhart.
9. "Smuggling Days and Smuggling Ways." By H. N. Shore.
10. "Sea Escapes and Adventures." By "Taffrail."
11. "The Buccaneers." By A. H. Cooper-Prichard.
12. "The Loss of the *Titanic*." By Lawrence Beesley.
13. "Great Storms." By L. G. Carr Laughton and V. Heddon.
14. "A Great Sea Mystery; the True Story of the *Mary Celeste*." By J. G. Lockhart.

A great literature has grown up around the sea and ships, and out of the mass a small number of volumes, selected alike for their interest and

literary merit, have been collected by Messrs. Philip Allan into a series of books of convenient size for the pocket. The first fourteen volumes of this admirable little library, uniformly bound in blue with gold lettering, and well printed, have now been issued, and the titles and the names of the authors are sufficient to show the diversity of subjects with which they deal. Based upon conscientious and thorough research, they are to be recommended to all lovers of sea literature.

"THE TIMES" TRADE AND ENGINEERING SUPPLEMENT. Published weekly. Price 3d.

The Trade and Engineering Supplement of *The Times* has a special section devoted to Aircraft once a month. This deals with military and civil subjects, gives the details of the latest machines as they become available, and in recent issues has discussed such subjects as the value of extreme speed, its influence on design, the new airships, municipal airports, Empire mails, and the value of slots.

R.A.F. STAFF COLLEGE.

All officers should have studied the following books before going to the Staff College:—

"British Strategy." Maurice.
"Some Principles of Maritime Strategy." Corbett.
"Small Wars, their Principles and Practice." Caldwell.
"A Short History of the British Commonwealth." Vol. II. Ramsay Muir.
"Imperial Military Geography." Cole.
"The Art of Writing." Quiller Couch.
"The Writing of Clear English." Westaway.

MANUALS.

R.A.F. War Manual, Part I (Operations), Part II (Organization).
Manual of Map Reading and Field Sketching, 1929, Parts I and II.
Signal Manual, Part I.
Flying Training Manual, Parts II, IV and V.

For officers who wish to pursue a more extended course of reading, the following additional books are recommended:—

STRATEGY AND TACTICS.

"The Science of War." Henderson.
"The Principles of War," Chapters I to IV. Foch.
"The Influence of Sea Power upon History." Mahan.
"The Navy and Sea Power." Hannay.
"Air Power and War Rights." J. M. Spaight.
"Air Power and the Cities." J. M. Spaight.
"Imperial Defence." King-Hall.

Histories.

"Periods of European History," Part VIII. Alison Phillip.
"A Short History of the British Commonwealth," Vol. I. Ramsay Muir.
"The European Commonwealth." Marriott.
"Official History of the War," comprising:—

(i) "War in the Air," Vol. I. Raleigh.
(ii) "War in the Air," Vols. II and III. Jones.
(iii) "Naval Operations" (for reference only). Corbett.
(iv) "Military Operations" (for reference only). Edmunds.

"A Short History of the Great War." A. F. Pollard.
"Forty Days in 1914." Maurice.
"The Last Four Months." Maurice.
"The Crisis." Winston Churchill.
"G.H.Q. and its Critical Decisions." Falkenhayn.
"German Strategy in the Great War." P. Neame.
"Life of Nelson." Mahan.
"Stonewall Jackson." Henderson.
"Life of Napoleon." J. Holland-Rose.
"Marlborough and the Rise of the British Army." Atkinson.
"Navies and Nations." Bywaters.
"British History in the Nineteenth Century." Trevelyan.
"World History, 1815-1920." Eduard Fueter.

These books can be obtained from Gale & Polden, Ltd., Wellington Works, Aldershot, or from their London Office, 2, Amen Corner, E.C.4.

R.A.F. UNIT CRESTS AND MOTTOES

Key No.

1. No. 1 (Fighter) Squadron: "In Omnibus Princeps."
2. No. 4 (Army Co-operation) Squadron.
3. No. 6 (Army Co-operation) Squadron: "Oculi Exercitus."
4. No. 600 (City of London) (Bomber) Squadron.
5. No. 601 (County of London) (Bomber) Squadron.
6. No. 602 (City of Glasgow) (Bomber) Squadron.
7. R.A.F. Staff College: "Visu et Nisu."
8. R.A.F. College: "Superna Petimus."
9. Electrical and Wireless School: "Thorough."
10. No. 4 Flying Training School.
11. School of Physical Training.
12. R.A.F. Depot: "Per Ardua."

Note.—For further particulars see Notices on page xlvii of this issue of The Royal Air Force Quarterly.

R.A.F. UNIT & SQUADRON CRESTS

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ARTICLES OF AERONAUTICAL INTEREST APPEARING IN CONTEMPORARIES.

"THE ARMY QUARTERLY."

April, 1930. *Vol. XX, No.* 1.

"Searchlights in Air Defence." By Major J. S. Baines, R.E.

"CANADIAN DEFENCE QUARTERLY."

April, 1930. *Vol. VII, No.* 3.

"Aerial Surveying as applied to Engineering Problems" (Illustrated). By A. M. Narraway, B.Sc., D.L.S., M.E.I.C.

"Leadership and Morale." By Squadron-Leader A. A. L. Cuffe, R.C.A.F.

"THE FIGHTING FORCES."

April, 1930. *Vol. VII, No.* 1.

"With the South African Air Force." By W. L. Speight.

"JOURNAL OF THE ROYAL UNITED SERVICE INSTITUTION."

May, 1930. *Vol. LXXV, No.* 498.

"Gold Medal Essay (Air) for 1929." By Wing-Commander C. J. Mackay, M.C., D.F.C., R.A.F.

"The Strategical Mobility of Air Forces" (Lecture). By Group-Captain C. L. Courtney, C.B.E., D.S.O., *p.s.c.*, R.A.F.

"The Fleet Fighter." By Lieutenant R. H. Barrett, R.N.

"The Defence of Daylight Bombing Formations." By Flight-Lieutenant W. M. Yool, *p.s.a.*, R.A.F.

"ROYAL ARMY SERVICE CORPS QUARTERLY."

May, 1930. *Vol. I (New Series), No.* 2.

"Some Considerations arising as a result of Aerial Gas Bombardment of an Overseas Base."

"THE ENGINEER."

June 6th, 1930.

"An Improved Searchlight for Air Defence." By Daniel Bengtson, Captain, Royal Swedish Artillery.

"The Development and Progress of the Aero Engine" (The Royal Aeronautical Society 18th Wilbur Wright Memorial Lecture). By H. R. Ricardo, F.R.S.

ROYAL AIR FORCE SPORT.

Fixtures, July-September, Inclusive.

Sat.	July	5	Cricket	...	R.A.F. *v.* The Army at The Oval.
Mon.	,,	7			
Tues.	,,	8			
Wed.	,,	9	Athletics	...	R.A.F. Championships, at Uxbridge.
Thurs.	,,	10			
Fri.	,,	11			
Sat.	,,	12			
Fri.	,,	11	Cricket	...	Adastrian Club *v.* Aldershot Command at Aldershot.
Sat.	,,	12			
Mon.	,,	14	Cricket	...	Adastrian Club *v.* Sir J. Cahn's XI, at Halton.
Tues.	,,	15			
Mon.	,,	14	Lawn Tennis		Airmen's Championships, at Halton.
Tues.	,,	15			
Wed.	,,	16			
Thurs.	,,	17			
Mon.	,,	21	Lawn Tennis		R.A.F. Championships, at Wimbledon.
Tues.	,,	22			
Wed.	,,	23			
Thurs.	,,	24			
Wed.	,,	23	Swimming		R.A.F. Championships at Cliftonville open-air baths.
Thurs.	,,	24			
Fri.	,,	25			
Sat.	,,	26			
Thurs.	,,	24	Cricket	...	R.A.F. *v.* Civil Service, at Chiswick.
Fri.	,,	25			
Wed.	,,	30	Athletics	...	Inter-Service Championships, at Portsmouth.
Fri.	Aug.	1	Cricket	...	Adastrian Club *v.* Royal Artillery, at Bulford.
Sat.	,,	2			
Mon.	,,	4	Lawn Tennis		Inter-Service Championships, at Wimbledon.
Tues.	,,	5			
Fri.	,,	8	Cricket	...	R.A.F. *v.* Free Foresters.
Sat.	,,	9			
Mon.	,,	11	Cricket	...	R.A.F. *v.* Royal Navy, at Chatham.
Tues.	,,	12			
Wed.	,,	27	Cricket	...	Adastrian Club *v.* Gentlemen of Suffolk, at Felixstowe.
Thurs.	,,	28			
Wed.	Sept.	24	Golf	...	Provisional dates for Autumn Meeting of the R.A.F. Officers' Golfing Association.
Thurs.	,,	25			
Fri.	,,	26			
Sat.	,,	27			

R.A.F. Athletic and Cross-Country Association.

The Royal Air Force Cross-Country Championships took place at Halton on Wednesday, March 26th.

Five Senior Stations were represented in the Open and twenty-one in the Junior Competition, the field numbering some 270 runners. There were several absentees among the well-known cross-country runners in the Royal Air Force, the most notable being A.C. R. H. Thomas, Henlow, who was unable to turn out through indisposition.

Cpl. S. Ferris, the Marathon Champion, of the R.A.F. Depot, was the first man home in 37 mins. 34 secs.—very good time considering the stiff and hilly nature of the course. He was followed by Cpl. W. Tym, Martlesham Heath, 38 mins.; and Aircraft Apprentice Langley, Halton, 38 mins. 6 secs., the performance of the latter being a very creditable one.

Halton, whose youthful runners packed well, won the Open Competition, with Cranwell runners-up; while Gosport and that fine sporting unit, Worthy Down, were first and second respectively in the Junior class.

Inter-Services Cross-Country Championships.

The Inter-Services Cross-Country Championships took place at Portsmouth on April 16th the course of six and a half miles being over the Portsdown Hills. The race was run in gloriously fine weather, and was witnessed by a distinguished gathering, amongst whom were Commodore the Hon. A. R. M. Ramsey, D.S.O., commanding R.N. Barracks, Portsmouth, and Air-Marshal Sir E. L. Ellington, K.C.B., C.M.G., C.B.E., A.D.C.

It was most unfortunate for the Royal Air Force, the holders, that well-known runners such as Cpl. S. Ferris, the marathon runner and R.A.F. Cross-country Champion, and L.A.C. R. H. Thomas could not turn out, both of whom were indisposed.

The substitutes acquitted themselves well, however, and although the R.A.F. team were beaten into third place, they were by no means disgraced.

The first man home was Cpl. Broadley (Army), in 32 mins. 15 secs., followed by A.B. Carter (Royal Navy), 33 mins. 40 secs., and A.C. Brown (Royal Air Force), 33 mins. 49 secs.

The placings and points were as follows :—

Army	31 points.
R.N. and R.M.	57 "
R.A.F.	79 "

R.A.F. Boxing Association.

The season 1929-30 started as usual with the Sir Charles Wakefield Tournament, which attracted a record entry.

A feature of the Meeting was the excellent form shown by the Officers, many of whom were equal to our Champions of five years ago.

The Open Trophy was won by Halton, who lead Henlow by one point.

The Junior was won by Digby, who brought off a dual win by topping the list of Officer entries. This feat has been equalled on one occasion only, and that was Halton's dual victory in 1920-21.

The Officers formed the nucleus of our team for the year, and their best performances were wins, by substantial margins, over representative teams of both Oxford and Cambridge Universities.

The Individual Championships this year were fought off at Uxbridge, and all who witnessed the boxing agreed that the form shown was the best ever produced by our Service boxers.

Results were as follows :—

Winners :—	*Officers.*		*Airmen.*
Feather	F./O. Purcell (Digby).	Fly ...	A. A. Hobbs (Halton).
Welter ...	P./O. Noblston (Netheravon).	Bantam	L.A.C. Williamson (Henlow).
Middle ...	F./O. MacKechnie (Calshot).	Feather	Sgt. Davison (Manston).
L./Heavy	P./O. Lord Douglas-Hamilton (Upavon).	Light ...	A.C. Herlihy (Gosport).
		Welter ...	Sgt. Harper (Henlow).
Heavy ...	P./O. Williams (Digby).	Middle ...	A.C. Clapp (Old Sarum).
		L./Heavy	A.C. Watts (Henlow).
		Heavy ...	L.A.C. Jones (Aldergrove).

The above winners were entered for the I.S.B.A. Championships, and the following are I.S.B.A. winners :—

	Officers.		*Airmen.*
Light ...	P./O. Noblston (Netheravon).	Bantam...	A.C. Johnson (Manston).
Middle ...	F./O. MacLean (Henlow).	Light ...	A.C. Herlihy (Gosport).

The winners, with the exception of F./O. MacLean and A.C. Herlihy, who were sick, went forward to the A.B.A. Championships, but were defeated.

The open Team Championships was won by Henlow from their old opponents, Manston, after a very fine display of keen boxing.

Henlow have now created a record by winning this trophy four seasons in succession, and thus qualified to meet the Champion Unit of the Army for the Sir Philip Sassoon Cup. Unfortunately, owing to a series of circumstances outside the control of the Station, and the R.A.F.B.A., this match did not materialize, and Henlow retain the Sassoon Cup for another year.

The Junior Team Championships was won by Digby, who beat Gosport in the final by one point after the best exhibition of team boxing ever seen in the R.A.F. Thus Digby, in addition to winning both Wakefield Trophies in their Sections, made a record which will probably stand unbeaten for a considerable period. To win these three trophies in one season is a remarkable achievement, and all concerned at Digby are to be congratulated.

The Apprentices' Championships were again held at Halton, and resulted in a win for Halton on points. This competition is at present run on Individual lines, as there is no trophy, but the R.A.F.B.A. hope that one may be forthcoming in the near future. The winners were :—

Fly ...	A.A. Cooper (Halton).	Mosquito...	A.A. Smith.
Bantam	A.A. King (Halton).	Feather ...	A.A. Shillito (Halton).
Welter ...	L.A./A. Joisce (Halton).	Light ...	A.A. Webber (Halton).
Midge ...	A.A. McNally (Ruislip).	Middle ...	A.A. Leete (Cranwell).

The individual winners competed against the Boys of the Army and Navy at Portsmouth for the Boys' I.S.B.A. Trophy, which was won by the Navy.

The season as a whole has provided good, clean sport and a large amount of new talent has been found, and many Stations are proceeding with the training of novices throughout the summer months with an eye on next season's Wakefield.

R.A.F. Fencing Union

The R.A.F.F.U. entered teams for the Magrini Cup and for the Laim Cup. In the former the team reached the semi-final, when it was defeated by the London Fencing Club ; in the Laim Cup they were the runners-up. Results :—

	R.A.F.F.U.	
Finsbury Club	Won	7—18
Sabre Club	Lost	20—16
Army	Lost	22—14
R.A.C.	Lost	16—9
L.F.C.	Won	11—17

R.A.F. Hockey Association

Royal Air Force Open Tournament—

Winners	Henlow.
Runners-up	Andover.

Royal Air Force Junior Tournament—

Winners	Upavon.
Runners-up	Wittering.

R.A.F. Football Association.

SEASON 1929-30.

The season has again been a successful one. After the Army had been defeated, high hopes were held of winning the Inter-Services Championship. In the Navy match, however, after holding a lead for three-quarters of the game, the defence gave way in the last quarter of an hour, and a defeat by 3 goals to 1 was sustained.

The R.A.F. XI brought off their finest achievement for many years when they defeated the Southampton Club by a goal to nil. The professionals turned out their full League team, but were deservedly beaten by the only goal of the match.

Two Amateur International caps were gained during the season, Cpl. Robinson playing for England and A.C. Kelly for Ireland.

The most pleasing feature of the season was the high reputation gained by the team for sportsmanship and clever football, and the Representative XI were stated by the Press to be one of the most popular sides in England.

R.A.F. Henlow defeated Kenley in the final of the Senior Cup by a goal to nil, after a drawn game, 2—2.

R.A.F. Lee-on-Solent defeated West Drayton in the final of the Junior Cup by 4 goals to 3.

RESULTS AS FROM FEBRUARY 1ST, 1930.

Wed.	Feb.	12	*v.* Civil Service	1—0	Won.
Sat.	,,	22	*v.* Wycombe Wanderers ...	1—1	Drawn.
Thurs.	,,	27	*v.* Fulham	0—0	Drawn.
Sat.	Mar.	15	*v.* The Army	4—2	Won.
Sat.	,,	29	*v.* Royal Navy	1—3	Lost.
Mon.	April	28	*v.* Southampton	1—0	Won.
Sat.	May	3	*v.* Reading	3—5	Lost.

SUMMARY OF THE SEASON.

P.	W.	L.	D.	Goals— For	Against
18	8	7	3	43	38

R.A.F. Officers' Golfing Association.

The Spring Meeting of the R.A.F. Officers' Golfing Association was held at Walton Heath Golf Club by kind permission of Lord Riddell. The entry was very good; 48 officers entered for the various competitions, and the play was of rather a high standard.

The R.A.F. Service Officers' Championship was decided; eight officers qualified for the match play stage, as follows :—

S./L. Barr Sim ...	158	Finch	Finch		
F./Lt. Finch ...	166	Silvester	4 and 3	Finch	
F./Lt. Macpherson	172	Jackman	Jackman	2 and 1	
F./Lt. Davidson ...	177	Davidson	6 and 4		Finch
F./Lt. Jackman ...	178	Bett	Bett		3 and 2
F./O. Nicholson ...	180	Nicholson	8 and 7	Barr Sim	
F./Lt. Silvester ...	182	Barr Sim	Barr Sim	3 and 2	
F./Lt. Bett ...	183	Macpherson	3 and 2		

F./Lieut. Finch played a very strong game all through, and in the final won on the 34th green by 3 up and 2 to play.

The Team Competition was won by R.A.F., Farnborough :—F./Lieut. Lambie, 169; F./Lieut. Schester, 170; F./Lieut. Bruce, 164; Total, 503.

Sqdn.-Ldr. Barr Sim won the 36-hole scratch prize with a very good score of 79+79=158, and F./Lieut. Finch was eight strokes behind with 79+87=166.

F./Lieut. Finch took the 18-hole scratch prize with 79.

At the end of the meeting, Lord Riddell very kindly gave the prizes away.

ROYAL AIR FORCE *versus* THE ROYAL NAVY AND ROYAL MARINES.

The match was played at Camberley Heath Golf Club, and the Royal Navy team gained a decisive victory, winning by 11½ to ½.

ROYAL AIR FORCE *versus* THE ARMY.

This match was played at West Hill Golf Club on April 15th, and resulted in another defeat for the R.A.F., the Army winning by 11 points to 1.

ROYAL AIR FORCE RIFLE ASSOCIATION

MINIATURE RIFLE COMPETITION FOR THE NOBEL CHALLENGE CUP.

The final stage of the above League Competition has been completed with the following results :—

R.A.F. College, winners	...	Challenge Cup and 10 Silver Medals.
H.A.D., Henlow, second	...	10 Bronze Medals.

Forty-nine teams of ten each competed in the first stage, and twelve teams qualified to compete in the second stage.

TEAMS AND SCORES.

Winners : R.A.F. COLLEGE.

Captain and Coach : Flt./Sgt. H. Tostevin.

Rank.	*Name.*	*Score— Deliberate.*	*Rapid.*	*Total.*
L.A.C.	W. Hall	98	98	196
F./Off.	H. C. D. Hayter	99	97	196
Cpl.	A. Rossner	98	96	194
A.C.1	G. Bayliss	96	97	193
Cpl.	J. Scudder	98	94	192
L.A.C.	C. Rose	98	94	192
Sergt.	W. J. Barratt	94	97	191
P./Off.	E. Coleman	97	94	191
	Totals	778	767	1,545
	Average	97·25	95·875	193·125
Reserves—				
F./Lieut.	G. W. Birkinshaw	95	95	190
Cpl.	G. House	95	93	188

Second : H.A.D., HENLOW.

Captain and Coach : S./L. J. Kemper, M.B.E.

Rank.	*Name.*	*Score— Deliberate.*	*Rapid.*	*Total.*
F./Lieut.	C. W. Hill	96	99	195
F./Lieut.	J. H. Winch	98	97	195
L.A.C.	D. Holdaway	98	95	193
Cpl.	P. W. Lambell	95	97	192
L.A.C.	L. N. Cooke	95	94	189
A.C.	R. Baker	94	94	188
Cpl.	C. H. Sexton	96	92	188
L.A.C.	G. B. Ellsey	94	92	186
	Totals	766	760	1,526
	Average	95·75	95	190·75
Reserves—				
L.A.C.	Hamilton	97	86	183
L.A.C.	Hubbard	91	87	178

The above Cup and Medals were presented by the Chief of the Air Staff at Bisley on Friday, June 6th.

ROYAL FORTH YACHT CLUB

By the courtesy of the Committee of the Royal Forth Yacht Club, Granton, Edinburgh, the privilege of honorary membership of the Club has been extended to all serving officers of the Royal Air Force.

SOME AVIFAUNA OF IRAQ

Foreword.

All ranks who have received orders for drafting to Iraq would be well advised to include in their kit a sporting gun, for it will afford them many hours of pleasure during their leisure time.

The Royal Air Force authorities in Iraq do not prohibit the use of sporting guns by *any* rating of the R.A.F., provided that such person is fully conversant with their correct use, and exercises due caution in their handling. Shooting parties, under the direction of a responsible officer, are an everyday occurrence in Iraq after the order " Cease work " has been given.

The birds of Iraq are remarkable and varied, a fact which is probably due to the suitable climatic conditions.

The Stork.

To commence, it should be noted by the tyro that there is one bird—and one only—which it is deemed impossible to shoot without incurring the " wrath of Allah." That is the stork, or, as it is better known to the Iraquis, the Haji Lak Lak (Holy Bird). It probably derives its name from the fact that it invariably builds its nest upon the top of the mosques—hence the belief of the Arabs that it is a " Bird of Allah," and should be safeguarded.

I remember how on one occasion a certain wireless operator at Kirkuk, not being *au fait* with the restrictions placed upon the extinction of this species, had the misfortune to " pot " one just after it had " taken off " from the top of a wireless mast. The bird fell to the ground, and whilst our worthy " gameshot " was examining his prey, he was surrounded by a none-too-friendly crowd of camp dhobis (washermen), dherzis (tailors) and other camp followers, who gesticulated wildly and attempted to explain to him in unintelligible jargon the inadvisability of his action. The situation was saved, however, by the arrival of the camp tindal (a sort of foreman), who pacified and dispersed the crowd. My worthy friend returned to his bungalow a much sadder, though wiser, man.

The foregoing story demonstrates the respect in which the stork is held by the natives of the land.

Now that the " ineligible " for the gun has been dealt with, it is possible to arrive at the " eligibles."

Sand Grouse.

Of all the species of birds which abound in " Mespot," the sand grouse can unhesitatingly be placed as the most in evidence. These birds are best sought after at their drinking time. They fly about in huge " schools," and the writer has observed on many occasions that they foregather in such large numbers as to resemble often a swarm of locusts passing across the sky. This can be verified by anyone who has been stationed at Kirkuk.

Sand grouse have a habit of swooping down low towards the irrigation ditches and other waterways which are dotted about the country, and this action is not unlike that of a machine "zooming." It is at this period of their flight that they offer the best advantage to "the guns," and one is well advised to situate oneself in the vicinity of the banks of streams. As these birds travel in such great numbers, it is quite possible to bring down a brace or more with one cartridge. The writer remembers bringing down six with one cartridge, having been fortunate enough to pop up from behind an irrigation-canal bank just as they were on the "zoom."

The Snipe.

"Mespot" possesses two varieties of this bird—the common snipe and the jack snipe. They are both recognizable by their remarkably long, slender and flexible bills, whilst the latter bird can be distinguished on account of its small size, as compared with the common snipe.

An hour or so spent with the guns on this genus tends to make even the amateur into something like a decent sportsman, as they are possessed of remarkable speed in flight. They have their haunts along irrigation ditches and wadis, and, when surprised, adopt a peculiar line of action. They rise and fly at a height of from four to six inches from the ground, and steer a straight course until they are at a reasonable distance from their disturber, when they soar to a remarkable height. When frightened they emit a sort of shriek, and can often be recognized by that fact. They are edible.

The See-see.

Whilst on the topic of birds of high speed, it is of interest to say a few words on a bird which is never encountered in England, and which bears a remarkable name, even for Iraq. That is the see-see. It is a species peculiar to Iraq, and in form is not unlike a small chick just hatched. It is possessed of a remarkable running speed (something like the ostrich of Australia), combined with a more remarkable flying speed. It is tame to a certain degree, inasmuch as it is invariably possible for one to get within shooting range of it; but when disturbed into flight, it adopts such a jerky line of flight that it is very hard to train one's gun upon it. The see-see, like the snipe, proves to be an admirable moving target for the very best shot.

The Quail.

This is in the same class as the foregoing with regard to speed. In Iraq, the quail frequents cotton plantations and marshland. When quail are located in cotton plantations, it is necessary to have beaters with the party, as these birds do not rise immediately on being disturbed, but run along the ground under cover of the cotton plants. They are edible.

The Pigeon.

The pigeon (*Arab.*, Joachin) can be found in practically every area of Iraq. There are many types, of which the best-known is probably the rock pigeon, whose plumage is of a deep blue colour. These birds may usually be traced to their drinking haunts at the foot of wells, and the method of bringing them within the range of the guns is the following. The guns stand well ahead from the well, and a chikko (native boy) or

one of the party then approaches the well-head and throws over a small pebble or similar object of sufficient size to disturb the pigeons at their drinking pool. Thus startled, they rise to the head of the well, and, after attaining a reasonable speed and height, they come within the range of the guns. This system is adopted largely around Kirkuk, and provides sport not unlike clay-pigeon shooting.

The Dove.

Although there exists a fair proportion of this species, it is not the practice to treat these birds as game; this is probably due to the dove's symbolic history, or to the sentimentality of the marksman. Doves are invariably to be found in orange and lime plantations.

Partridge.

On several occasions, the writer had the good fortune to be included in shooting parties which embarked on a " partridge-hunting mission," with the ultimate " bag " of a few brace of this genus. The partridge, however, is not in great abundance in Iraq, and they have only been observed in the Kirkuk region. The black partridge was the species most in evidence.

The Egret, or Aigrette.

This is a " period " bird, and can only be discovered at certain times of the year. During the writer's two and a half years in Iraq, only one " school " was observed. The bird is not unlike a small heron. Its colour is white and its head bears a crest of golden plumage. The crest is very valuable, and is used extensively as a decoration for ladies' hats.

Having dealt with the smaller types, I will now pass on to the " heavier than air " type, so categorized because of their apparent clumsiness and size.

The Bustard.

Of these, the bustard takes precedence, both in size and in impregnability. The bustard is a genus of marsh bird, somewhat similar to the crane. It flies at a reasonably low altitude, and at so slow a speed as to give one the impression that it merely flops across the sky. The bird derives its name from the Latin *avis tarda*, or " slow bird," and a more suitable name could not have been invented. I have stood beneath it within shooting range, and have blazed away, only to be rewarded with nothing for my cartridge but a few stray feathers. My readers will probably laugh to themselves at this, but to anyone who has made a similar attempt to " bag " one of these birds, the foregoing is sufficient. I can assure my sceptics that some of the best shots in No. 30 Squadron have made several unsuccessful attempts to bring down one of these birds, and have been rewarded with no greater results than my own. One can hear the " plop-plop " of the pellets as they hit the bird, but its feathers are so strong and its body so thick-skinned, that it is almost invulnerable, except to " elephant shot " or a .303. In point of fact, I have only seen *one* brought down and that by the latter armament: so there is still a chance waiting in Iraq for the expert marksman to prove his prowess. The colloquial Arabic for this particular bird is "Doornah."

The Goose.

Our attention is now claimed by the goose, which, despite the abnormal temperature of 126 degrees in the shade, is not, as my readers might imagine, yet cooked. There is little or no difference in form between the English goose and the Iraq goose. The bird makes good hunting, and on many occasions our daily rations have been supplemented with this delicacy.

Duck.

There are three varieties: the mallard (or wild duck), teal, and common duck. The mallard is easily distinguished by its gorgeous plumage of many hues, whilst the teal is similar in many respects, but is of smaller size. Duck are best hunted after the "rainy season," and one can almost be certain of exploring marshland with good results.

Crane, both Blue and Common.

These birds are not considered suitable for the palate owing to the fishy nature of their food. They can be recognized by their abnormally long legs, neck and bill. They are invariably observed wading about in wadis and waterways, searching for food. The Greater Zab River, in the Mosul region, is a favourite haunt of this species, to which is allied

The Cormorant.

The cormorant is a sea-bird of prey, and is usually found on practically any of the rivers in Iraq. Especially is this genus in great evidence on the banks of the Zab rivers, in the region of the Mosul Vilayet.

The Arabs apparently have yet to discover the secret of fishing with these birds, as practised by the Chinese. (*Note*.—The Chinese have adopted a very ingenious method of fishing with the aid of these birds. They set off in a dhow, with a "cargo" of coolies and cormorants. The cormorant has a ring placed over his neck which slides down as far as it will go. He is then put overboard to search for food. He catches the fish, which, of course, cannot enter his stomach owing to the ring. He is hauled on board again and the fish removed. This process is repeated times out of number.)

The Arabs' lack of appreciation of this is probably due to the fact that the bird is hard to trap, and that difficulty would be experienced in training it in its natural wild state to its duties.

Before concluding, there is a bird well known to most of the R.A.F. personnel in Iraq as the "Did-you-do-it." I believe that it is a genus of sheldrake, but it is a noteworthy fact that when startled it emits a noise which sounds exactly like "Dijee-do-it." Hence the nickname by which it is known to most R.A.F. sportsmen.

THOUGHTS:

On Golf

The Golfer has no sense of shame,
Existing solely for his game;
Recking not how much he bores,
Garbed in the "plusiest" of fours
With jumper of an hundred hues
And shapeless but expensive shoes.

The pastime was invented by
A Scotsman of the deepest dye,
Who, without pity, grace, or ruth
Sent us the whole of Scotia's Youth;
Ripe Adolescents in their teens
To carry clubs and nurture greens
And earn unconscionable fees
For heaping sand upon the tees.
Others receive colossal screws
For finding all the balls we lose
And selling them to countrymen
At hauf-a-croon for nine or ten.

Magnificent, indeed sublime
The Golfing Pro., who spends his time
(When not engaged in hunting Pots
of which they all have lots and lots)
In wondering how on earth we play
With clubs like those we've brought to-day
And hinting that he has a Store
From which we may acquire more
Befitting to our style of play.
We cannot, dare not, say him nay,
Lest he refrain from mentioning
The retrogression of our swing;
Or fail to give his wonted boo
When we omit to follow through;
Or cease to murmur something nice
When we eradicate our slice.

The Oldest Member is a Fount
Of Wisdom, and will oft' recount
To each and every mother's son
Tales of the holes he did in one.
He heaves a sigh for spacious days
Before all these new-fangled ways
Of striking balls became the fad.
He thinks them uniformly bad
And is content for callow pups
To emulate for silver cups
And much prefers the flowing bowl
Presented at the nineteenth hole.
When I am beaten out of sight
I'm not so sure he isn't right.

On Rugger

I like to see the Harlequins at play;
  I like to see how strenuously they strive;
I marvel, so ferocious is the fray,
  That any one of them is left alive.
I watch the labour of their heaving chests,
  The heavy burden of bemired feet,
And mark the ripping of their sullied vests
  Soaked icily with persevering sleet.
    I'm glad I'm not expected to resort
    To such exhausting sport.
    I thank my stars that anyone can see
    That I am forty-three.

These lads are very nippy on their pins:
  They run like hares with hounds well on their tails.
A lot they care for hackings on the shins.
  They're fit as fiddles and as hard as nails.
They may be stigmatized as muddied oafs
  By the ungodly, febrile and effete:
The kind of man who only sits and loafs
  And shivers in his eighteenpenny seat:
    The kind of man that thinks all sport a trade,
    And players should be paid.
    I hope that no-one thinks the same of me—
    But then, I'm forty-three.

Dashed fine three-quarters, these; they move like gods.
  Look at that line-out—every man tip-toe.
That winger's off—by Jove, though, heavy odds—
  Can he get through with half the field to go?
Well collared, sir—a beauty, low and clean:
  That full-back is as steady as a rock:
As neat a tackle as I think I've seen—
  I feel a superannuated crock
    Watching the pack get down to it and thrust
    Whilst I sit here and rust.
    At least they ought to let me referee:
    I'm only forty-three.

Pack down, there—use your feet—it's gone in right.
  Wheel, wheel, you cripples—use your feet—it's through;
No, scrum again—Great Cæsar, what a fight—
  It's out—well tackled—stick to him like glue;
He's up again—a try at last—well run.
  Just like the one I scored for School—Hey hey—
And now I'm shelved, and missing all the fun:
  I'd give my ears to be wing-three to-day.
    A dozen times he had the full-back beat
    But couldn't quite compete.
    I know I'm half again as fast as he—
    I don't *feel* forty-three.
    Ah well, I've had my share, so can't complain
    Or live my life again. . . .
    These lads will have a waist-line just like me
    When they are forty-three.

On Tennis

Exasperating, isn't it?
When you at last have learned to hit
That hopping, shooting, spinning ball
Accurately against a wall,
To find that on a proper court
Your hefty drives are falling short,
Your cunning lobs descend outside
And volleys travel far and wide;
Even your service, once so true
Insists on double-crossing you,
And every fresh disaster meets
With ribald comment from the seats.

The path of those who wish to win
Is strewn with pitfall and with gin,
For books are written every day
Teaching the Tyro how to play:
All teeming with a thousand tips
On fancy strokes and racket grips,
With heaps of don'ts and lots of do's
And hints about the choice of shoes.
When you have read these Mentors through
You won't know what on earth to do.
Each Author has his special bent
And every one is different.
When you've achieved a top-spin drive
And feel it's good to be alive
The next edition that you read
Will say it's very wrong indeed
And recommend a hearty smack
With spin applied from front to back.
With Dogma so divaricate
You're in a very parlous state.
Such books as these, it's safe to say
Made Tennis what it is to-day—
A maze of scientific fact
Inordinately inexact.

A fatal fascination hangs
About this game of biffs and bangs
For the Patrician and the Pleb.,
For Dowager as well as Deb.
The Princes (Royal or Merchant) plan
To head the waiting list at Cannes:
Whilst Judkins, who is so demure
When seen in his Department Store
Would barter his immortal soul
To figure in a Stellar rôle
And then forsake the sale of hose
To swell the ranks of U.S. Pros.,
Turning existence, once so tame
Into a very paying game:
But if the fashion spreads, I fear
There'll soon be no-one left to cheer,
Unless they go about in batches
Attending one another's matches.
There can be no alternative—
Even Professionals must live.

IVAN HELIER.

THE R.A.F. COMRADES ASSOCIATION

To the Editor of "The Royal Air Force Quarterly."

SIR,

It may possibly interest your readers to learn that the preliminary stages in connection with the formation of the Royal Air Force Comrades Association have now been successfully concluded.

The Provisional Committee elected by General Meeting held in London on April 23rd last has met at regular intervals to pursue the affairs of the movement, and is now ready to present the result of its deliberations to the First Annual General Meeting. This is to be held in London at an early date, and will be notified through the Press.

Membership will be open to all who serve or have served with H.M. Air Forces, *i.e.*, Royal Air Force, Royal Naval Air Service, Royal Flying Corps, or the Dominion Air Forces.

The Association will in no way converge with existing institutions and is to abstain from charitable motives.

To touch briefly upon its objects: the Association is to promote *esprit de corps;* encourage sociable gatherings, *i.e.*, organize reunion functions, establish London and Provincial branches; perform service to each other, or, in other words, keep alive that wonderful spirit of comradeship which has always been one of the outstanding characteristics of the Air Services.

Liaison is to be maintained with the authorized institutions which deal with the provision of employment for ex-officers and airmen in order that members may be put in direct touch with the authorities concerned.

The writer would be pleased to hear from any of your readers interested in the project.

Yours, etc.,

W. COEN, *Hon. Secretary*,

R.A.F. Comrades Association, Eastchurch, Kent.

PARTICULARS REGARDING ENTRY INTO THE ROYAL AIR FORCE

I.—OFFICERS.

General Duties Branch.

1.—Permanent Commissions.

Permanent officers are entered in such numbers as to provide in the ordinary course of promotion the officers required to fill the higher command, technical and general administrative posts in the Royal Air Force. In the earlier stages of their career they are engaged in becoming experts in flying duties: subsequently a large proportion are expected to specialize in one aspect of the work of the Royal Air Force, *i.e.*, engineering, wireless, armament, photography, or navigation, or in staff duties. The method of entry for permanent commissions is as follows:—

(*a*) *The Royal Air Force College*.—The Royal Air Force College is maintained to afford a special education lasting two years to flight cadets between the ages of 17½ and 19½ on entering the College.

Full particulars are given in Air Publication No. 121; price 3d.

(*b*) *University Graduates*.—A proportion of the permanent commissions granted in the Royal Air Force is offered to University men. Candidates for entry under this scheme must be graduates of their University, must be unmarried and between 20 and 25 years of age, and must be recommended by their University.

Full particulars are given in Air Publication No. 904; price 4d.

2.—Short Service Commissions.

The balance of junior posts is filled by short-service officers who are employed for a period of five years on the active list, after which they are required to serve a period of four years in the Reserve. A strictly limited number of permanent commissions are awarded to officers holding short-service commissions. The majority of such commissions awarded are allocated to officers qualifying for specialist training, but a few are also granted to those officers recommended as specially suitable by their Commanding Officer. A further strictly limited number of appointments to medium service are made to fill flying posts requiring greater experience. The period of medium-service employment on the active list is five years following immediately after the five-year short-service period, *i.e.*, ten years' employment on the active list, followed by four years in the Reserve.

Officers transferred to the Reserve after completing their full period of service in the active list will be paid a gratuity of £375 for five years' service, and £1,000 for ten years' service.

Chard School

SOMERSET

Founded 1671 — *Reconstituted* 1928

A PUBLIC SCHOOL FOR BOYS, OFFERING PARTICULAR ADVANTAGES TO SONS OF R.A.F. OFFICERS.

Tudor Buildings: School Chapel: Cadet Corps: New and Extensive Playing Fields.

There is accommodation—in Three Houses—for 150 Boys.

A NEW DINING HALL AND CLASSROOMS HAVE JUST BEEN COMPLETED.

Fees: £75 per annum

Bursaries up to the value of £15 a year are available for the sons of Royal Air Force Officers.

Headmaster: D. B. M. Hume, M.A. (Cantab.), F.R.G.S., late Captain, Royal Air Force.

Illustrated Prospectus together with Particulars from the Headmaster's Secretary.

Entry to short-service commissions is by selection from men who are of good physique and reasonably well educated. Age limits, 18 to 29.

Full particulars are given in Air Ministry Pamphlet No. 13; price 2d.

Stores Branch.

A small number of vacancies for permanent commissions in the Stores Branch of the Royal Air Force are offered annually for competition to men who have had not less than five years' business or industrial experience in the employment of a company or firm of standing, and are between the ages of 23 and 25. Accepted candidates must pass an interviewing board and compete at a written examination conducted by the Civil Service Commissioners.

Full particulars are given in Air Ministry Pamphlet No. 17; price 2d.

Accountant Branch.

A small number of vacancies for permanent commissions in the Accountant Branch of the Royal Air Force are offered annually for competition to men between the ages of 22 and 26 who have a good theoretical knowledge and wide practical experience of accounting. Accepted candidates are required to pass an interviewing board and compete at a written examination conducted by the Civil Service Commissioners, the standard of the accountancy portion of which is that of the final examination of the Institute of Chartered Accountants and of the Society of Incorporated Accountants and Auditors.

Full particulars are given in Air Ministry Pamphlet No. 18; price 3d.

II.—AIRCRAFT APPRENTICES.

Aircraft apprentices are enlisted and trained as highly skilled craftsmen. Period of apprenticeship, three years. Entries take place twice yearly. Candidates are required to pass a competitive educational examination. Age limits, 15 to 17 years. Period of service, twelve years from the age of 18, but suitable men may be allowed to re-engage to complete twenty-four years for pension.

Full particulars are given in Air Ministry Pamphlet No. 15; free.

III.—APPRENTICE CLERKS.

Apprentice clerks are trained in general clerical duties or for specialist work in pay-accounting or in stores-accounting. Period of apprenticeship, two years. Entries take place quarterly. Candidates are required to have either an approved school certificate or to pass a competitive educational examination. Age limits, 15½ to 17 years. Period of service, twelve years from the age of 18, but suitable men may be allowed to re-engage to complete twenty-four years for pension.

Full particulars are given in Air Ministry Pamphlet No. 9; free.

The publications mentioned herein may be purchased from Gale & Polden, Ltd., Aviation Department, Wellington Works, Aldershot.

NON-REGULAR FORCES.

Information regarding the Reserve of Air Force Officers can be obtained from the Secretary, Air Ministry, London, W.C.2. Inquiries

as to appointment to the Special Reserve or the Auxiliary Air Force should be addressed to the officer commanding the squadron to which appointment is desired. The addresses of these squadrons are as follows:—

Special Reserve.

No. 501 (Bomber) Squadron.—Filton, nr. Bristol.

No. 502 (Ulster) (Bomber) Squadron.—Aldergrove, County Antrim, Northern Ireland.

No. 503 (County of Lincoln) (Bomber) Squadron.—Waddington, nr. Lincoln.

No. 504 (County of Nottingham) (Bomber) Squadron.—Hucknall, Notts.

Auxiliary Air Force.

No. 600 (City of London) (Bomber) Squadron.—Finsbury Barracks, London, E.C.1.

No. 601 (County of London) (Bomber) Squadron.—54, Kensington Park Road, Notting Hill, London, W.11.

No. 602 (City of Glasgow) (Bomber) Squadron.—49, Coplaw Street, Glasgow, S.2.

No. 603 (City of Edinburgh) (Bomber) Squadron.—Learmouth Terrace, Learmouth, Edinburgh.

No. 604 (County of Middlesex) (Bomber) Squadron.—Hendon Aerodrome. Applications to County of Middlesex Territorial Association, 66, Victoria Street, S.W.1.

No. 605 (County of Warwick) (Bomber) Squadron.—Castle Bromwich, Birmingham.

No. 607 (County of Durham) (Bomber) Squadron.—Aerodrome, Usworth. Applications to The Durham County Territorial Association.

No. 608 (County of York, North Riding) (Bomber) Squadron.—Aerodrome, Thornaby. Applications to North Riding Territorial Army Association.

AWARD OF HONOURS AND DECORATIONS

The following awards were published in the *London Gazette*, dated June 3rd, 1930 (King's Birthday Honours List):—

K.C.B. (Mil.).

Air Vice-Marshal David Munro, C.B., C.I.E., M.B., Ch.B., F.R.C.S. (E), (Retired).

C.B.E. (Mil.).

Wing-Commander Harold Edward Whittingham, M.B., Ch.B., F.R.F.P.S. (G), M.R.C.P. (E), D.P.H., D.T.M. and H.

O.B.E. (Mil.).

Wing-Commander William Millett.
Squadron-Leader Hugh Leedham.
Squadron-Leader Alan George Bishop, A.F.C.

M.B.E. (Mil.).

Flight-Lieutenant Sidney James Bailey.
472 Sergeant-Major, 1st Class, Alfred Box.
798 Sergeant-Major, 1st Class, Frank Lamdin.
7677 Sergeant-Major, 1st Class, Laurence Richard Fears.

R.R.C. (First Class).

Miss Katherine Christie Watt, Matron, Princess Mary's Royal Air Force Nursing Service.

Bar to A.F.C.

Squadron-Leader Augustus Henry Orlebar, A.F.C.

A.F.C.

Squadron-Leader Alan Lees.
Flight-Lieutenant Henry George Watts Lock, D.F.C.
Fight-Lieutenant Alfred Randles Wardle.

R.R.C. (Second Class).

Miss Esther Wilson Hunter, Sister, Princess Mary's Royal Air Force Nursing Service.

B.E.O. Medal (Mil.) for Meritorious Service.

358497 Leading Aircraftman Arthur Horace Street.
2172 Orderly-Room-Sergeant Fazal Ahmed, Aden Protectorate Levies.

AIR SCOUTS AND GUIDES

Squadrons of Air Scouts and Air Guides were formed at the Royal Air Force Station at Cranwell in 1928-1929 from among the children of past and present personnel of the Service. The organization is so based that the movement can extend to Air Force stations at home, abroad and in the Dominions.

The 1st Squadron, Cranwell Air Scouts, was formed in November, 1928, by Sergeant-Major Beresford, with the object of providing healthy recreation for the sons of R.A.F. personnel, past and present, on the station.

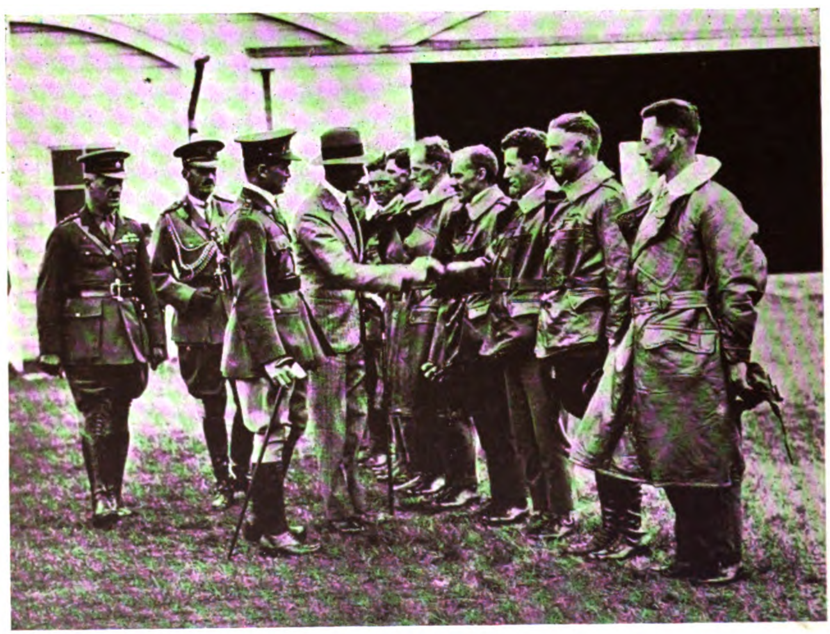
Various useful subjects are taught, which include signalling, first aid, knotting and splicing, athletics, gymnastics, boxing, shooting, woodwork, the internal combustion engine, aircraft construction and general knowledge.

No. 1 Squadron, Air Guides, Cranwell, was formed in May, 1929, with the object of getting together as many as possible of the daughters of the past and present Air Force personnel, to encourage comradeship and to teach useful occupations, and to give them some pleasant form of occupation and recreation when they are not at school.

In addition to instruction in drilling, games, dancing and gymnasium, certain tests are made for the various classes of Guides. These tests include such useful accomplishments as carrying messages correctly, simple first aid and physical training.

Printed in England and Published by GALE & POLDEN, LTD., Wellington Works, Aldershot. Overseas Agents :— INDIA: THACKER, SPINK & Co., Calcutta and Simla; THACKER & Co., LTD., Bombay; HIGGINBOTHAMS, LTD., Madras and Bangalore. CANADA: IMPERIAL NEWS CO., LTD. AUSTRALIA and NEW ZEALAND: ANGUS AND ROBERTSON, LTD. SOUTH AFRICA: W. DAWSON & SON (S.A.), LTD., 29 and 31, Long Street, Cape Town.

WIGRAM AERODROME ON THE OCCASION OF THE VISIT OF H.R.H. THE DUKE OF YORK.



H.R.H. THE DUKE OF YORK INSPECTING RESERVE PILOTS OF THE N.Z.A.F.
The officer on the extreme left is Squadron-Leader T. M. Wilkes, M.C., who is now the Dominion Liaison Officer at the Air Ministry.

THE PERSONAL FACTOR IN FLYING, AND THE INFLUENCE OF FLYING ON CHARACTER

By Wing-Commander A. G. R. Garrod, M.C., D.F.C., *p.s.a.*, R.A.F.

There is still a tendency with some people to regard flying as a dangerous art, which merely reflects the restlessness of the age and is only fit to be pursued by wild and reckless spirits. The object of this article is to present the other side of the picture and to show that flying has a definitely valuable influence on character and that the element of danger only creeps in when the pilot neglects the lessons which he should have been taught when he was first mastering the art.

There are two periods in a pilot's flying life when he needs to exercise special caution with himself. The first period is when he has completed about ten to twenty hours of solo flying and is tempted to believe that he can perform evolutions in the air which he has seen carried out by more experienced pilots. The second period is when he has about 200 hours of solo flying behind him and feels that now at any rate he is justified in considering himself fully trained. The truth of the matter is that there is always something fresh to learn in flying (this, incidentally, is what makes it so interesting), and that, however experienced one may be, one can never afford to take liberties in the air.

Why, then, does there always seem to be so strong a temptation to take liberties? The first effects of flying on the mind are probably

(*a*) An intense exhilaration at this new method of rapid movement in a hitherto untried element, coupled with a feeling of wonder at the expanse and beauty of the view one obtains from an aeroplane.

(*b*) A sense of new freedom and unlimited power, gained from the ability to range in any direction and at any height over wide spaces of land and sea.

Now, when a man is thrilled with some new experience, he finds it difficult to keep his feelings to himself. He longs to tell others of his discovery, and share its wonders with them. If, moreover, his discovery brings with it (as flying does) a sense of mastery over some

new power in Nature, he will be sorely tempted to exhibit his newly acquired skill to others less fortunate than himself. These are two reasons why pilots have so often been inclined to indulge in aerobatics near the ground.

The remedy lies in careful instruction during the early stages of flying training. The need for *self-control* in the matter of low flying, and especially of low aerobatics, cannot be too strongly impressed on the pupil. This is one important respect in which flying plays a valuable part in character training. The pilot is given control of a machine possessing wide range and great power. But he has to learn to exercise restraint in his use of that power by avoiding any flying which causes annoyance to others on the ground or involves unnecessary risk to himself.

After *self-control* comes *self-reliance.* The pilot of an aeroplane, when once he has left the ground, is master of his own fate. If he gets into difficulties, only his own skill, and no one else's, can extricate him. If he loses his whereabouts he cannot stop and ask the way. The slightest deviation from his correct course, if maintained over a long flight, will carry him many miles from his destination. The pilot himself must decide whether to persevere in spite of adverse conditions or whether it would be wiser judgment to turn back. One should not exaggerate the difficulties that have been mentioned, for they cause little anxiety to the pilot who has trained himself with care and skill. They are merely stated to illustrate the point that learning to fly should exert a valuable influence in developing *self-reliance.*

Aeroplanes move faster than any other vehicle controlled by man, and it follows that the brain of the aeroplane pilot must be capable of making *quick decisions.* It must also be constantly on the alert, so as to avoid being taken by surprise. Then again an aeroplane, though a powerful machine, is a very delicate one, and requires to be handled with a *sensitive touch.* Many pilots make the mistake of failing to identify themselves with the aeroplane, and of flying as if they were repeating movements learnt from a book. The reason is that they lack the *sympathy* which is just as essential between man and machine as between rider and horse.* All these qualities of quick decision, of co-ordination of hand and eye through the brain, of sympathetic and sensitive touch, are qualities whose development must have a beneficial effect in character training.

Finally, it must always be remembered that the penalty of a serious mistake in flying is usually a heavy one. Here again there is no need for alarm, because the well-trained pilot develops qualities which enable him to avoid making serious mistakes. Such qualities are *imagination* and *foresight,* by means of which he will make provision to meet

* See article, "Equitation as an Aid to Efficiency in the Royal Air Force" by Wing-Commander A. W. H. James, M.C., Vol. I., No. 3 of this Review—Ed.

all possible contingencies; *thoroughness* and *attention to detail* which will ensure that his equipment is maintained in as perfect a condition as possible; and *concentration* while in the air so as to avoid being caught unawares. If one thing is certain it is that one cannot afford to be slovenly or slipshod in one's flying. It must be done well or it is best left alone. Knowledge of this fact keeps a pilot alert and keen, and should prevent him from becoming careless or half-hearted.

Enough has been said to show how learning to fly plays a valuable part in character training. No one will deny that all the qualities which have been mentioned are desirable qualities to possess. Most men possess them in some degree, though in many they may lie dormant through lack of opportunity for their development.

Why, then, do accidents occur? The majority are caused not by any mechanical defect in the aeroplane itself, but by a neglect on the part of the pilot to exercise those qualities which his flying should have developed. In other words, it is the personal factor—the man, not the machine—which is at fault. For even if an engine failure does occur, it should be possible to effect a forced landing, without injury to the occupants of the aeroplane, provided imagination and foresight have been employed in choosing a route over suitable country, and provided the pilot flies high enough to give himself a chance of selecting a suitable field. The most awkward moment for engine trouble to arise is when the aeroplane is taking-off; but even the accidents that have occurred under such circumstances might have been avoided, if the pilot's brain had worked more quickly in putting the aeroplane down to its correct gliding angle, and if he had not forgotten in the emergency that it is fatal to try to turn back to the aerodrome.

The accidents that occur in flying as the pilot is taking-off are far more often due to failure of the personal factor than to failure of the engine. The pilot fails to observe an obstruction ahead of him, or in his desire to be spectacular executes a climbing turn off the ground (forgetting that an aeroplane stalls far more easily in a climbing turn than when climbing straight ahead).

In fact, one can safely assert that of the flying accidents that occur practically none are caused by structural defects in the aeroplane itself and very few are caused by engine trouble. The vast majority are due to what is usually described as an "error of judgment on the part of the pilot." Among such errors of judgment mention has already been made of aerobatics near the ground. This is a form of flying that should be reserved for special occasions (*e.g.*, flying exhibitions) and should only be carried out by highly experienced and carefully trained pilots. For all others it is a simple matter of self-control to avoid such flying.

There remains the most frequent cause of flying accidents, namely, "stalling," or loss of flying speed, near the ground.

Now every modern aeroplane gives ample warning to the pilot if he is not letting it fly fast enough. As the speed drops and approaches the stalling point, not only is there a suspicious silence about everything, but lateral control begins to disappear, and the aeroplane becomes nose-heavy. This nose-heaviness makes itself felt immediately on the control column. It is as if the aeroplane were a horse asking the rider for more rein.

Failure to observe these warning signs may be due to one of two things. Either the pilot is heavy-handed, has a clumsy touch, and lacks sympathy with his machine; or he is surprised by a sudden emergency (engine trouble, or the proximity of another aeroplane), is thrown off his mental balance, and fails to make the correct movements of the controls. It all comes back to the personal factor—to the need for quick thought, delicacy of touch, and concentration. There is nothing dangerous in the act of flying itself. The only danger lies in the failings of the human element.

It will no doubt be urged that the above claim provides but poor consolation, since human nature is essentially frail and cannot change within a generation. But it is just because human nature and personal judgment are apt to fail that constant attention should be paid to the personal factor in flying training. There may be a few pupils who fail to develop the characteristics outlined above, and for such as these the best advice is that they should give up flying. If the remainder—the large majority—will remember the importance of these qualities, and will always concentrate on what they are doing, while flying, and will never allow themselves to become careless or haphazard in the air, they will not only avoid flying accidents, but will be training themselves more and more in the exercise of valuable qualities of character.

WESTERN SAMOA OPERATIONS, 1930: AIR REPORT

By Flight-Lieutenant S. Wallingford, N.Z.P.A.F.

During the past three years, there had been growing a spirit of unrest and dissatisfaction amongst the Samoans over the question of New Zealand's mandate for Western Samoa, and this spirit, which developed into defying and generally hampering the Administration in its efforts of progress, was fostered by certain disgruntled Europeans and half-castes for motives of their own. The Samoan, being of a childlike disposition and by nature a lover of intrigue, followed willingly, and the movement developed into an organization known as the Maù with its motto of " Samoa for the Samoans." The result was that natives who were usually most peaceful and law abiding were encouraged to obstruct the officials in their duty; they even shielded fugitives from justice, and their attitude became one of truculence.

This state of affairs culminated (in December last) in a riot in Apia, in which one New Zealand constable and nine Samoan members of the Mau were killed and many others wounded. The New Zealand Government then determined to deal firmly with the situation, ordered the dispatch of H.M.S. *Dunedin,* and on January 6th decided that a detachment of the N.Z.P.A.F., with a Moth seaplane, should accompany the cruiser to assist the naval forces in the maintenance of law and order.

After a very hurried preparation, Moth Seaplane No. 995 was flown to Devonport on January 8th, embarked in H.M.S. *Dunedin,* and stowed with wings folded on an extension to " X " gun-deck, the event being worthy of note in that this was the first seaplane to be flown from the Hobsonville base, and the first of its type to be carried in a cruiser. The aircraft was lashed down on its cradle covered with two canvas side screens, and during the five days at sea was made ready for operations against the Mau, in co-operation with the landing force. On the arrival of the cruiser in Apia on January 12th, it was found that the disloyal natives had taken to the bush and that they had refused to recognize the authority of the Administrator. Orders were therefore given for the force to land.

With the advice of the Harbourmaster, a shore base for the seaplane was selected at Matautu, a point on the Eastern side of the harbour and sheltered from the prevailing wind. Disembarkation on

January 13th was quite a tricky proposition, and entailed hoisting out the seaplane with wings folded, spreading the wings while still suspended, and dropping the seaplane on to the crest of the swell to which Apia harbour is very exposed. The aircraft was then towed to the selected base which proved to be most unsuitable for launching and hauling up owing to surf breaking on the beach; a site at the Native Administration compound at Mulinuu, on the west side of the harbour and on the shore of a lagoon well protected by the main reef, was finally decided on. But for submerged logs floating inside the reef, and the fact that it was risky to taxi at the lowest state of the tide owing to isolated coral heads, this situation would have been ideal for the handling of seaplanes.

The base detachment consisted of one officer and two corporals of the N.Z.P.A.F., one naval signalman, and a permanent guard comprised of seven stoker ratings who also formed the wader party. The men were quartered in a native fale* in which hammocks were slung, and the Officer i/c Detachment billeted with the Secretary for Native Affairs.

The aircraft was secured to its landing chassis above the high-water line, and, being in the open, maintenance was difficult in the heat of the day, and especially in wet weather. Had it been known that the length of occupation would extend to two months a native structure could have been built to serve as an improvised hangar.

From the commencement of flying on January 16th, to the day of re-embarkation on March 11th, a total of ninety hours' flying was carried out.

The policy of the Administrator was to break up the hostile organization and to arrest the men wanted on warrant. For this purpose the intentions of the Force Commander were to keep pressure on the Mau, to maintain control over the villages in the vicinity of their camps, and, when situated in bush positions difficult of access, to produce a feeling of insecurity by keeping the tribe on the move; it was also intended to prevent their escape to the island of Savaii.

Air work, which was nearly all confined to the island of Upolu, consisted of general reconnaissance and co-operation with the ground forces, maintenance of communication by message dropping and ferrying, distribution of propaganda, and very limited offensive action. Short reconnaissance flights to the eastern end of the island of Savaii were made on only two occasions when patrolling the straits.

Reconnaissance.

Maps of Upolu were found to be poor and often erroneous, and on one occasion the pilot was enabled to find and fix for the Lands and Survey Department the approximate position of a lake in the hills towards the eastern end of the island.

* Hut.

In this respect air observation proved of great value, not only in verifying the existing map, but also the coastline and contours of those areas over which it was intended to operate. It is considered that a photographic reconnaissance would have been of the greatest value to the ground forces, and it was unfortunate that the necessary equipment was not available. A private camera was used on several occasions but the results were generally too badly defined to be of any use.

Observation over cultivated ground was good, though over copra plantations very low flying was necessary in order to pick out men in the shadows. Over bush country observation was impossible at any height, and only the slightest signs of presumed encampment such as dead leaves cut on the edge of a clearing and the state of the tracks could be seen. Tracks through the bush were almost impossible to follow from the air, but they could often be traced through small clearings. Smoke rising through the bush and plantations could easily be seen, but smoke was never observed in areas in which the Mau were reported to be in hiding.

Along the coast observation was easier, in that any movement was usually confined to roads close to the coastline and through the villages, but difficulty was always experienced in distinguishing members of the Mau from loyal natives. The Mau lavalava*, of a dark blue or green shirt with a white stripe, was recognizable under 500 feet, but after the commencement of operations very few of these lavalavae were worn, and those worn were usually changed or turned inside out on the approach of the aircraft. Movements of fautasis† were very easy to pick up, but here again one could never distinguish the loyal from the disloyal, and a Mau lavalava was never seen in a boat.

Other signs of the existence of the Mau in these coastal districts were by indication, such as native mats hanging round the sides of a fale and completely hiding the inside from view; the drying of lavalavae on a line; the preparation of baskets of food, presumably for the Mau encampments in the bush; and the general attitude of the natives, either in running for cover or assuming a bearing of complete indifference, or, on the other hand, waving and running towards the aircraft.

On February 10th a movement east of about two hundred of the Mau was observed in the Lefaga district, and daily contact was maintained with this movement up to February 14th, when they were reported as having encamped in the bush, inland from the Safata district, roughly twelve miles along the coast from where they were first seen.

Communications.

A short-wave wireless telegraphy set was fitted in the front seat for operation by a Leading Telegraphist from H.M.S. *Dunedin*, but

* Loin Cloth. † Whale Boat.

through insufficient engine revolutions it was not possible to carry a passenger during the first flights, and owing to constant adjustment being necessary it was not a success for transmission by the pilot. It was accordingly removed from the aircraft for use by a platoon on the south coast, and during contact patrol Very lights and message bags were the only means of communication from air to ground.

When in the vicinity of wireless telegraphy posts, urgent signals were dropped in message bags and transmitted by wireless telegraphy to H.M.S. *Dunedin*, but generally the return of the aircraft to its base was sufficiently prompt for information to be acted upon. The dropping of message bags was most useful to isolated posts, in some cases saving two days' delay; and the method was of special use when the wireless of the Aleipata Police broke down. This same method was employed when dropping circulars on ground stations for certain chiefs to meet the Administrator in fono*. These circulars were then distributed by the district police to the chiefs concerned. Ferrying of headquarters and platoon officers was undertaken to two districts—to Lefaga Bay, which was not a very suitable landing area, and to Safata Bay, which was very good inside the reef. Good seaplane landing areas were also observed inside the main reef at Mulifunua, Aleipata, and along the south-west coast from Falelatai to Cape Fatuosofia.

Propaganda.

Four publications were distributed at different times to all districts in Upolu, two thousand pamphlets being considered sufficient for one distribution. By these pamphlets the Administrator was enabled to keep in closer touch with the natives, especially the more loyal, and they were of great advantage in that the whole island received these pamphlets within two hours and long before any counter opinions could be circulated. Previously, such distribution would have taken anything up to a week, and then only in conjunction with Mau literature and exaggerated messages from the disloyal leaders.

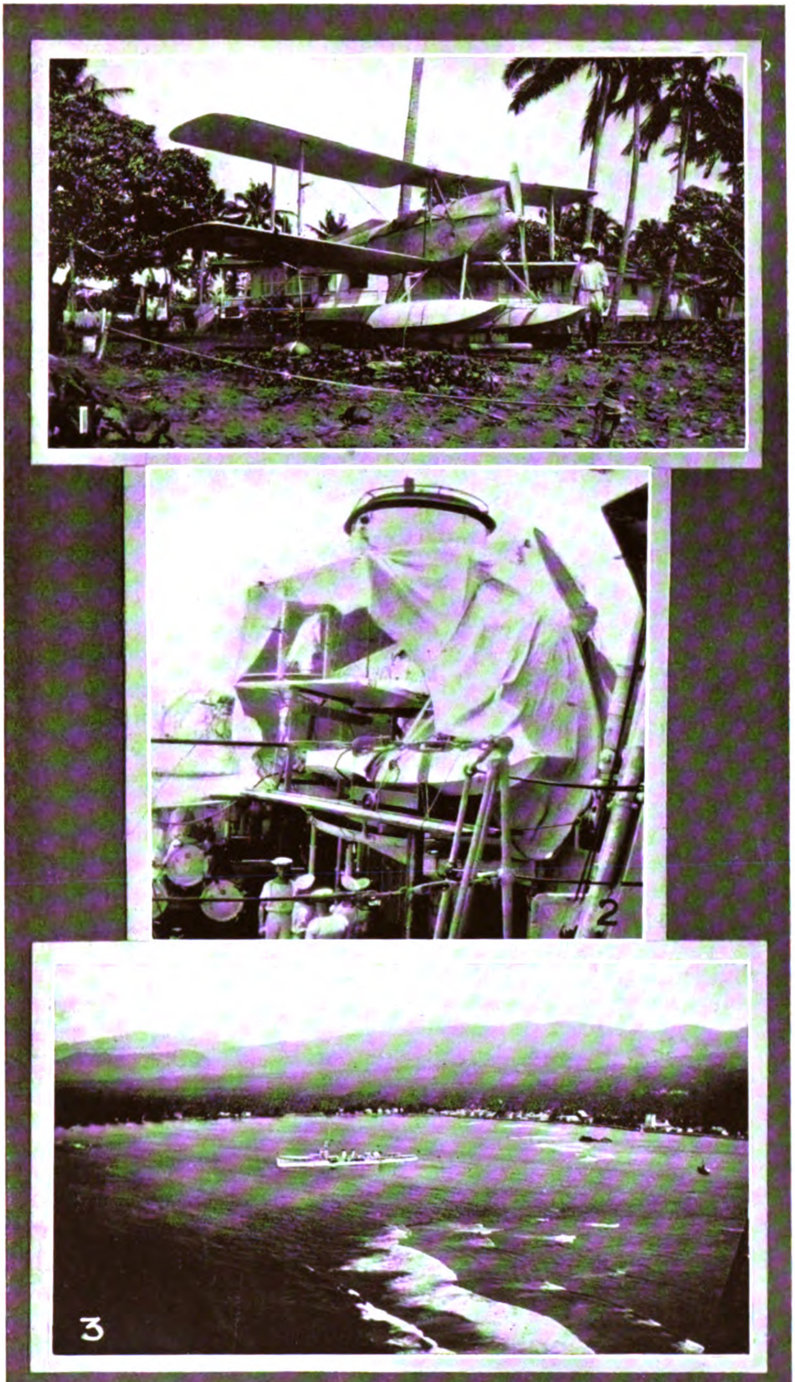
The method of dropping was by hand, in rolled bundles of fifty to a hundred, and at a height just above the coconut trees, this low altitude being dictated by the fact that villages were often situated on strips of beach where inaccuracy of dropping might have meant the pamphlets falling into the sea on one side, or into swamp and bush on the other.

Offensive Action.

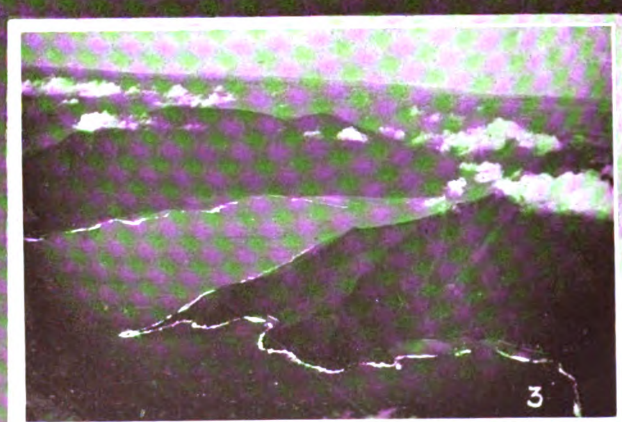
This was limited solely to the use of Very lights, which were used for signalling the position of any men seen wearing Mau lavalavae, and also in turning back fautasis observed crossing the straits to Savaii.

On January 18th, one small fautasis carrying eleven men was success-

* Native Council.



1. AT THE MULINUU BASE.
2. SEAPLANE STOWED ON "X" GUN DECK.
3. APIA AND HARBOUR SHOWING H.M.S. "DUNEDIN" MOORED IN REEF PASSAGE.



1. **SHOWING THE METHOD OF FITTING THE LEWIS GUN, and**
2. **THE CONTROL.**
3. **FAGALOA BAY, NORTH-EAST COAST.**

fully turned back by this means, and another larger boat was forced to land hurriedly on the island of Manono. Again, on January 23rd, while flying at fifty feet along the south coast off the village of Aufaga, a stone was thrown dangerously close to the aircraft. On making another circuit to learn the exact intentions of the stone thrower the pilot loaded his Very pistol, and on a second stone being thrown the Very light was fired in return, whereupon the native fled to the bush. Unfortunately, the light set fire to the Pulinuu's house and the fire had to be extinguished by his wife, but no more stones were thrown in that locality. It was afterwards ascertained that stone throwing is a favourite pastime of the Samoan, and a sport in which he is extremely accurate. The incident did good, however, in that the seaplane was subsequently treated with greater respect, and the tale was spread amongst the natives that the aircraft spat fire. In the Safata Bay operation on January 27th, several paopaos* escaping from the peninsula to the mainland were successfully turned back by this means.

A bomb, consisting of 3 lbs. of dry guncotton in a cylindrical container, was constructed by the Torpedo Lieutenant. The method of dropping was by hand, and it was fired on impact by a striker held by a safety spring. This bomb was dropped ahead of the bows of the larger fautas—mentioned in the preceding paragraph—in an attempt to force the crew to return. It was fortunate that the bomb did not explode, for it was afterwards found that this fautasis belonged to an Australian missionary returning to the island from the mainland. The next bomb to be constructed was of similar design but fired by a pistol with safety fuse, and this was kept in reserve. The use of the bomb was intended for dropping at a safe distance only, and simply for the demoralizing effect which would probably have resulted from the noise of the explosion.

In readiness to use Lewis-gun fire, should it have been found necessary, a fitting to the rear starboard centre section strut was constructed for a forward gun to be operated by the pilot. Alternatively, the same fitting could have been used on the rear port centre section strut for use by an air gunner.

Forced landing equipment carried in the locker included a service revolver and ammunition for protection of aircraft and for shooting down coconuts in the event of a shortage of rations. Also included in this emergency outfit was a heaving line for use by the pilot to enable him to reach the ground in the event of a forced landing on high trees.

Meteorological.

Whilst the humidity was almost double that of Auckland and added to the difficulties of maintenance, flying conditions were very good.

* Small Canoes.

Tropical storms, however, were very trying, and although they were usually of such local extent that they could be avoided, there were occasions when the pilot was compelled to fly through them. The worst occasion was on February 1st, when engaged in dropping propaganda leaflets. A very heavy rainstorm was centred over the precipitous north-east coast, and the pilot was forced out to sea to avoid the high coastline. Flying at water-level, the only means of direction was by dead reckoning, and this was by no means easy in blinding rain with gusts up to fifty knots. The compass carried in the aircraft undoubtedly proved its worth.

Type of Aircraft.

The use of a land type would have been impossible in this country, as there was not a suitable landing ground or beach throughout the whole island of Upolu, and in the event of a forced landing when working inland the result would have been a certain crash with either land plane or seaplane. When within gliding distance of the coast the seaplane could have made a safe landing at any time on nearly all parts of the coast except the north-east, which is unprotected from the open sea.

Moral Effect.

The effect of the presence of the aircraft on the Samoan, especially in the early stages of the operations, was great and it was unfortunate that it was not possible to follow up this moral advantage with some harmless demonstration over the Mau strongholds. In pursuance of the peaceful policy of the Administration, however, the results of air co-operation more than justified its use, in that it forced the Mau to keep under cover, hampered their movements from camp to camp, and prevented them making clearings and building more comfortable shelters. Moreover, it forced them to cook their food only at night, it added generally to their discomfort, and, when they eventually emerged from the bush, they had very little desire to return to it.

The subsequent truce arranged from March 1st enabled the leaders of the Mau to meet the Administration, and this meeting resulted in the wanted men being given up, and the return of the villagers to their houses.

This report would be incomplete without some reference being made to the great help received through H.M.S. *Dunedin*, without which air operations would have been difficult and considerably handicapped; and to the excellent work of the rigger and fitter, which was all the more creditable when one realizes the extremely difficult and often trying conditions under which they had to perform their duties.

EMPIRE AIR POLICY

By Captain A. P. C. Hannay, M.C., Cameron Highlanders.

The recent debate in the House of Lords on the extension of Air Force duties in relation to Empire policy reveals that some very archaic ideas still exist in high quarters with regard to the application of air power in general as the representative force in support of the local administration.

The very name of aeroplane seems to conjure up in many peoples minds, even in these enlightened days, visions of wild and indiscriminate bombing, machine gunning, and consequent wholesale butchering of innocent women and children.

This, in fact, is almost invariably the underlying tone whenever air operations or extension of the policy of "air control" are mentioned. Further, there is a great tendency to confuse the substitution of air control for ground occupation with the numerous other Air Force duties, such, for instance, as home and Empire defence and duties in co-operation with Navy and Army or independent air action.

Now let us examine and compare the question of air control with the older existing methods from present-day examples, and see whether increased air control is not really a practical, efficient, and infinitely cheaper form of control, and, further, a form of control, while admittedly inapplicable to all parts of the Empire, at any rate applicable in far greater degree than at present utilized.

Before proceeding further I must declare my inability to discuss the "nautical" or flying boat side of the question, as I have no practical experience of this side, whilst being convinced, however, that in this respect, as well as on land, the increase of air control is both practical and advisable.

To revert. We have, on the one hand, the really first-class example of air control in Iraq, and more recently also in Aden, Transjordan and the Sudan. The statistics as regards cost for Iraq and Aden are so well known in respect of economy that it is not necessary to reiterate them. Suffice it to say that the resultant difference in cost between air and ground control is about one-tenth to one-twentieth (in favour of air control). That alone is surely an overwhelming advantage.

Now to examine the lesser known aspects of the case.

Firstly, to deal with punitive operations, and in this I will also include the North-West Frontier of India. Ground punitive operations

in Iraq, the Sudan and the North-West Frontier achieve little beyond a temporary effect. The cost is incredible in relation to the achievement. The casualties, including our own luckless soldiers (so readily and rapidly forgotten these days—when an enemy has to be patted on the back and sympathized with by our "political patriots" at home) are frequently high in relation to the objects attained, for casualties occur through sun and heat in summer, and cold and exposure in winter, as much as from enemy action. The enemy casualties, if we must consider them, from modern high explosive are frequently high—the suffering and deprivation of his women folk through ground punitive measures is just as severe, if not more so, than from air action.

The minute the expedition is withdrawn the whole happy game starts again, and the soldier and taxpayer try to look cheerful about it, and pretend they enjoy playing at war, while paying for their "pleasure" through the nose.

So much for a brief summary of the innumerable petty ground expeditions in Iraq, the Sudan, and the North-West Frontier of India under the much-vaunted system of control by ground occupation.

Now to take the air aspect.

In the comparatively short experience of the use of the air arm as a punitive force, the story has been singularly successful. In Iraq, after a few sharp and firm lessons, the unruly tribes have been quick to realize on which side their bread is now buttered. The air arm, properly used, is swift and sure, and terrifying. The casualties to the enemy can be limited—the minute he sees sense—and the casualties to our own side are often infinitesimal compared to ground operations, and the consequent saving in cost almost unbelievable.

To give one concrete example out of many in recent years.

The tribe of the Abdur Rahman Khel, who have been subjected to several punitive expeditions in past years, each costing fortunes and with no lasting effect, were successfully brought in solely by air operations concentrated over a period of fifty-four days early in 1925—a hitherto unprecedented and complete surrender by this warlike section of tribesmen. The cost to the taxpayer was a flea-bite compared to previous expeditions against this tribe.

In no case, I believe I am right in saying, have post-war operations of a punitive nature been started without first giving ample warning and ample time to comply with the demands of the civil authorities. Surely, even in these "squeamish days," nothing more humane could be done or more practical by way of enabling women and children to be evacuated first.

So much, therefore, for the actual case of punitive operations from a ground and air point of view.

Now to turn to the extension of Air Force duties in peace time—as a policing force in place of the older methods of ground occupation and control exercised by the Army—and let us examine this also from existing examples and very respectfully suggest how and where these duties might be largely increased.

Before quoting any examples or making any suggestions there are two important points of view to bear in mind.

Firstly, there is that voiced by such experienced and distinguished soldiers and administrators as Field-Marshal Lord Plumer and His Excellency Lord Lloyd. Lords Lloyd and Plumer declare that by the substitution of air control for ground occupation the personal touch, so necessary to the successful administration of our great Indian Empire and other Dependencies and Colonies, is completely lost. No one, least of all Air Force personnel, will deny the great use of that personal touch, but that the Army units are in any large degree responsible for it is, to my mind, rather far-fetched. The people who really maintain that personal touch are the local civil administrators, with their small band of assistants and police. They know the language, the customs, the individuals, good and bad, and the conditions pertaining to their respective areas. The constantly changing regiments and their even more rapidly changing personnel know little of these subjects, and, if the truth were known, care even less. In fact, the regiments know less of the people, country and conditions—other than their immediate surroundings—than does the flying personnel of a squadron some hundred or more miles away; and, what is more, flights or squadrons abroad are not infrequently used for the purpose of assisting in maintaining that selfsame personal touch that Lords Lloyd and Plumer stress so much.

This is done by means of visits to outlying districts, flights for the local emirs or sheiks—sometimes as an errand of mercy to bring medical aid, or to assist political officers with personal conferences. In short, sound propaganda work generally in a way that could never be achieved by any other method.

So, in my opinion, the argument of "personal touch" through the medium of Army units stationed in various districts is not a very strong one as a reason in opposition to the proposal of substitution of air control for ground occupation.

Then there is the second aspect of this subject: that held by Air Force personnel.

No Air Force officer will contend that in a real emergency he can act entirely without the aid of ground forces. No one appreciates their worth or potentialities more wisely and truthfully than does the airman. But substitution of air control for ground occupation spells, to the Air Force or any other officer, concentration of ground forces,

and this in time spells economy in more ways than one, *e.g.*, supply and internal administration.

Now to expand this point of view by way of explanation—to translate it into terms of " practical politics." The classical example is Iraq.

Now although Iraq is under air control, this does not mean that there are no ground forces in Iraq at all. Far from it. There are ground troops, originally British and India, now replaced by Iraq Army, Levies, and R.A.F. (Armoured Car) Sections. With the exception of the Levies, the system of control does spell greater concentration.

Briefly, the political agents and special service officers and civil police still administer and maintain that requisite personal touch and feel the pulse, as it were, of every local situation, whilst the country is in a broader sense policed from the air, squadrons and a few armoured car sections being so placed, strategically, to meet any probable untoward situation until the arrival of reinforcements by air. In addition, emergency landing grounds and aerodromes are prepared and opened up at any and all likely and useful places, and levy posts help in keeping a watchful eye on these and the situation generally.

The remainder of the troops, air and ground, are, in this particular instance, concentrated in and around Basrah, Baghdad and Mosul. This concentration facilitates administration and training, also hygiene and health generally. If emergency demands, ground troops can be rushed by R.A.F. troop carriers to the nearest landing ground in the affected area and enabled to " get on " with their job.

Now at this juncture several points and queries arise which require explanation and answer respectively.

Firstly, that for air control troop-carrying squadrons are, in my opinion, a necessity.

Secondly, air control is limited, if not ineffectual, under certain conditions of land and weather, *e.g.*, dense forest areas or country subjected to long periods of rain or fog.

Apart from such conditions, however, there are, I feel sure, great opportunities for considerable extension of air control in many parts of the Empire hitherto subjected to ground occupation.

One question, however, remains to be answered. I have frequently been asked, suppose aircraft and troops were required in a certain area where there was an emergency landing ground, what is to prevent the landing ground being pot-holed or ploughed up so as to prevent aeroplanes from landing?

Well, as I see it, the answer is something like this.

Any country which is to be under air control is not going to have landing grounds dotted about at complete random. Compatible with certain physical features, aerodromes and landing grounds will be so

placed that they can be easily and rapidly reached by local civil police or levies, or will be of such size that their complete destruction within a reasonably short time would be very difficult. Air control spells speed of action, and wireless telegraphy, an integral part of air control, spells rapidity of information. Unruly and turbulent mobs take some time to be guided into cohesive action, and in that time single-seater fighters, which yearly increase in performance, could, in a country subject to carefully-worked out strategic air control, reach and protect any aerodrome or landing ground from interfering mobs pending the arrival of the troop carriers. At very worst, in an emergency, there are very frequently alternative places where aircraft can be landed in safety.

After all, the United States Marine Air Corps recently contended successfully with similar contingencies in Nicaragua under very trying conditions, and against a bitter and tenacious enemy, well armed and versed in every aspect of guerrilla warfare.

Finally, if the defence of a comparatively compact affair like a landing ground for a short period, albeit only by armed civilian police, till the arrival of regular troops by air, raises apprehension in the minds of those accustomed to ground occupation, how much more alarm should these same people feel for miles of unprotectable railway, road, or possibly river, as the only other alternative means of communication between disaffected areas?

Now for a few very humble suggestions as to how and where air control can be extended in our vast Empire, leading to greater efficiency with a corresponding decrease in expenditure.

At the moment of writing, the newspapers daily bring graver and graver news from India, and that some degree of force will have shortly to be exercised seems rather more than probable.

My own conviction of the efficacy of air control in many cases in peace, war and civil disturbances is such that I advocate India as a country where air control can by degrees be entirely substituted for ground occupation.

The number of military stations at present occupied in India (exclusive of those held by levies or detachments of less than a battalion) is over 150—a truly *grand* total—and the overhead charges for their annual maintenance and that of their occupants must be something staggering. Under air control I would advocate something like fourteen air-cum-military stations—Delhi, Lahore, Pindi, Kohat, Quetta, Karachi, Ahmedabad, Poona, Bangalore, Jubbalpore, Lucknow, Patna, Calcutta and Rangoon.

Mark all these on a map and start measuring the distances. With the exception of Rangoon, no station is 500 miles distant from the next, and many are far less. Five hundred miles can be done easily in a

single flight by modern twin-engined troop carriers, and in a very short time single-seater fighters, with a duration of three hours and a cruising speed of 200 m.p.h., will also exceed this range.

Surely the inference is obvious. Now is the time to start calling in these expensive outlying detachments, any or all of whom may need succour in a crisis. Prepare enlarged stations, cut down ground forces, start preparing intermediate and emergency landing grounds, and reorganize the Civil Service and civil police equipment, particularly wireless, to dovetail into the new air policy plan. Admitted the initial expenses may be a bit high over the first two or three years, but many parts of India lend themselves admirably to such a new system, and the eventual saving in maintenance will, I am confident, be very considerable. Further, if such a plan is tackled courageously, the initial cost should be partially offset almost from the beginning by a corresponding reduction in expenditure on ground troops.

It is far beyond the scope of this article to go into great detail, but the lines along which I have discussed extension of air control should give some grounds for argument at least, and that its extension is applicable in many parts of British possessions in, for example, Africa, is, in my opinion, beyond doubt.

The substitution of air for ground forces as the power in support of the administration is merely a new method for achieving the same object, but whether the force employed is from the ground or from the air neither can function if innumerable political handicaps are to be imposed on its application in emergencies. I am further convinced that in the long run the use of the air "corrective," if required, is far more lasting, far more humane, and therefore far more desirable than any "correction" employed by scattered ground forces.

Some distinguished person has likened the use of Air Forces when acting as the power behind the administration to a mailed fist with the glove permanently "off." Nothing could be more misleading. An aeroplane is harmless till its guns are on and loaded and its bombs are on the bomb racks ready for release, *but its appearance has a great moral effect.* Even in comparatively sophisticated countries like India its potentialities, not only for destroying life but also for saving it, are tremendous, and its range, speed and general method of progression place it in a unique position as a means of peaceful surveillance. These factors alone should give the "lie direct" to anyone imputing Air Force control with relentless Prussianism.

Now briefly to summarize.

1. Air control, in substitution for ground occupation, must *not* be confused with the numerous other Air Force Imperial duties, either when such Air Forces are required to act independently or in co-operation with the other Services.

2. Air control, while admittedly inapplicable in all parts of the Empire, is, nevertheless, capable of being utilized and expanded very considerably, and yet be vastly economical in initial and annual expense. This is not only the case in large, open, comparatively flat countries, where the population is still below western standard as regards modern progress, but also in mountainous areas; where communications are still comparatively scant; where weather conditions admit of the use of aircraft almost all the year round; and, finally, in a country where it is still necessary to maintain troops in considerable numbers in support of the local administration.

3. Air control does not spell the complete disbandment of ground forces, but it does imply their concentration, which, in turn, means considerable reduction in numbers, economy, increased facilities for administration and combined training, and, therefore, increased efficiency; and it further releases ground troops for other Imperial duties if still required; or, alternatively, it permits of the money hitherto expended on ground occupation to be put to other civilizing agencies, such as roads, railways, etc.

4. Air control does not mean loss of personal touch between the administration and the people, because for efficient air control that touch will have to be more in sympathy than ever with all situations and with the force in support. This, therefore, spells greater cohesion, both practical and psychological, between the civil services and the military air element. Further, the plea put forward that it is the presence of the military which largely exercises that personal touch is, I feel, not so weighty as certain persons would have us believe.

5. Successful air control implies the use of troop carriers, and possibly also single-seater fighters, as the *modus operandi,* and those ground troops which are a necessary adjunct to air control must have ample opportunities for "air" training, so that they come to look on the use of aircraft as an everyday affair and to appreciate their uses and limitations.

6. Finally, whether the force employed in support of the Government is air or ground, each will be equally impotent if bound by rigorous political interference in emergencies, but I maintain that the air arm, properly used, is the swiftest, most efficient, most humane, most economical, and the most lasting in moral effect.

Surely now is the time to oust the sceptics, to use our courage, both physical and moral, to apply and further build up our knowledge of the use of that form of control, which, as sure as day follows night, will supersede ground occupation in many parts of the Empire in a very few years' time—in short, air control.

AN INTERNATIONAL AIR FORCE

By J. M. Spaight, C.B.E.

PART I—FANTASY.

The great events of August, 1938, are so recent that they are still in everyone's mind. They are, nevertheless, worth recapitulating on account of their epochal importance as the first instance of the smothering by the new international air police of an incipient outbreak of war.

As everyone knows, the neighbouring States of Colossia and Urbania had been at variance for some years in the matter of the Minority Optants, as it was called. Into the rights and wrongs of that question it is unnecessary to go here. It is sufficient to say that it was a question upon which feelings in the two countries ran high from time to time, especially among people who wondered, without admitting it, who on earth the Minority Optants were. The question had come before the Council of the League of Nations, but had proved to be one upon which unanimity could not be reached, and upon which, therefore, no recommendation for a settlement could be made. It remained open, therefore, a festering sore in the relations of the two countries. Everyone hoped, nevertheless, that the dispute would prove to be one which time would heal, and there were surprise and consternation when, suddenly and without warning, the Colossian Government, aggravated apparently by some unwise public utterances of the Lady President of the Urbanian Republic, addressed to that country a demand for the cession of named frontier regions of Urbania, coupled with a conditional ultimatum, and simultaneously ordered a general mobilization of the Colossian forces. The event startled the civilized world. All men had hoped that the days of such sabre-rattling exhibitions of national temper were gone for ever.

Colossia's action was, indeed, a contravention both of Article 10 of the League's Covenant, which is a guarantee of the territorial integrity and political independence of the member States, and of Articles 12 to 15, which prescribe a peaceful procedure for the settlement of disputes. It was also an infringement of the provisions of the Briand-Kellogg Pact of 1928 for the "outlawry" of war, but no sanctions are attached to that instrument, which rests solely on the good faith

and honour of the parties to it. It was under the Covenant that the League intervened.

Its intervention was prompt and successful. Luckily, the arrangements for joint action in an emergency had been perfected a few years before, and the machinery then established stood the test.

Under the old system, that which was in force (for example) in 1930, intervention would have been, if it had taken place at all, a much slower business. First, the Council of the League would have had to be summoned to deal with the initial question of responsibility for the resort to hostilities. The Council would have had to decide who was the aggressor, and for this purpose the unanimous vote of the members, excluding the representatives of the two parties to the dispute, would have been necessary. Then the Council would have had to consider whether it should recommend that the sanctions, economic and military, of the League should be put in force. After that the Government of each nation would have had to decide, first, whether the *casus foederis* had arisen; secondly, whether the military as well as the economic sanctions should be applied. Obviously only military sanctions would have been of any use in such a situation. Then, in all democratic countries, it would have been necessary to obtain Parliament's authority for the "war" credits required if the military operations involved in the decision to apply the sanctions were to be undertaken. In various countries Parliament might not be in session and would have had to be specially summoned. Finally, the order for mobilization would have had to be given and the forces made ready and dispatched to take part in combined operations not previously planned and organized in detail. All these stages would have taken time to complete, and meanwhile there was every probability that the unfortunate Urbania, left to her own resources, would have been irretrievably overwhelmed.

Actually, under the system introduced in 1935, the complications and delays which must inevitably have occurred under the former system were all avoided. The instant that the Secretary-General of the League heard of Colossia's ultimatum, with its threat of immediate hostilities, he summoned the Council urgently, and the members of the Council flew to Geneva that day. A meeting was at once held, and by a majority vote the Council agreed to support Urbania. In the old days unanimity would have been necessary and this would have been unobtainable, because Colossia had taken care that she had a "friend at court," and one or two States represented on the Council supported Colossia's action. They held that she was really acting in self-defence, though she had been cleverly manœuvred by Urbanian diplomacy into a position in which she seemed to the world to be the aggressor; and self-defence, they pointed out, was legitimate alike under the Covenant

of the League and the Kellogg Pact. The dissenting vote of the States who held this view would have prevented any recommendation from being given and the League would have been powerless. As it was, the abrogation of the former rule in regard to unanimity prevented such a deadlock from arising.

The Council's decision reached, telegraphic instructions were at once dispatched by the commander-in-chief of the international air force, in the name of the League, to all sectional commanders of that force, ordering its immediate mobilization and concentration. As everyone knows, the international air force consists of contingents of national air forces placed permanently at the disposal of the League of Nations and amenable to its orders, without the interposition of any national authority. They are located in their national territories, but are differentiated from other national forces in so far as they are subordinate for certain purposes to the international air commander-in-chief at Geneva and serve under a (national) sectional commander appointed by him. For purposes of ordinary administration they are controlled by the air force authorities of the country to which they belong, but for technical administration, training, equipment and operations they are directly under the technical and air staffs of the headquarters of the international air force at Geneva, and it is by these staffs that inspection of both personnel and armament is carried out. They are, in fact, so many sections of the international air force "boarded out" in the various countries but owing allegiance to the central executive. Such is, briefly, the system established in 1935; one in which the wardenship of the marches of world peace and order rests safely in the hands of international air power. To the commander-in-chief of the international air force is committed, under the League and, of course, Providence, responsibility for the security of Europe.

The new system was on its trial in August, 1938, and it stood the test. In each country to which the cipher message from Geneva came the local section of the international air force was immediately mobilized and dispatched to its appointed station, either in Urbania or in some other League country within striking distance of Colossia; some, of course, of the units could operate from their homeland. There was no delay, no failure at any point. The system was so simple, so fool-proof, that all possibility of breakdown was eliminated. It was so framed that all the legal and constitutional formalities ordinarily necessary in connection with mobilization and war measures in democratic countries were avoided or short-circuited. In the old days in Great Britain the Prime Minister would have been bound to advise His Majesty to summon Parliament (which was not in session) in an event of such grave emergency. As it was, Parliament had not to be troubled at all. The expenses of the mobilization fell not on the British

Exchequer, but on the international credit, of ample amount, created and administered by the League for just such a purpose. The authority from Geneva was sufficient to allow all the pre-arranged steps to be taken.

Within twenty-four hours of the receipt of the orders the British units, bombing and fighter, of the international air police were in motion. Squadrons from other states were ready too. They came literally on the four winds of heaven, all fully equipped and ready and all bearing, beside their national markings, in great red letters the initials of the League—S.D.N. That symbol was their passport; it gave them right of passage wherever the writ of the League ran. Swiftly and unerringly they took up the places and assumed the functions assigned to them in the operational plan—one of hundreds—worked out in every detail at Geneva for just the emergency that had come to pass. Everything had been foreseen, everything organized to perfection, nothing left to chance. There was no hitch anywhere. The cogs and gears of the whole great machinery of sanctions engaged smoothly, unfailingly, swiftly.

The Colossian military junta had reckoned on some failure of the League's organization of repression. Their awakening was rude. Naturally, the first shock of encounter was in the air, when the Colossian fighter machines sought to bar the path of the League's bombers moving to attack the first objectives assigned to them—the troop trains, encampments, shell dumps, and all the military concentrations of the Colossian forces. They tried to bar the path in vain. The new British bombers, with their improved armament, proved able to beat of the enemy fighters' attack, to pierce their defence and to reach the objectives to be bombed.

There was at this stage, it may be explained, no battle of fighters *versus* fighters. That came later, when the Colossian authorities concentrated in the area of encounter practically the full strength of their fighting aircraft in a " circus " far exceeding in numbers of machines that which Manfred von Richthofen led in 1917. With this great mass of aircraft they hoped to crush the Allies' onset in the air, but that hope was unfulfilled. A number of British fighter squadrons (Bulldogs) and French *escadrilles de chasse* (Wibault, Loire-Gordou-Leseurre, Nieuport-Spads) broke up the Colossian formation, and the Czechoslovakian fighters (Avia and Letov) and Dutch Fokkers joined in the attack. Other League aircraft were known to be on their way and not far distant. The fighting was fierce and protracted, many machines on both sides going down in flames or out of control, but the issue was never doubtful. Superiority both in numbers and in performance was on the side of the Allies. In particular the British pilots and machines proved themselves the masters of their opponents. They

could outclimb and outmanœuvre the Colossians, and bravely though the latter fought they were practically hounded out of the air. As a fighting force the Colossian formation was all but destroyed.

Meanwhile great events were happening elsewhere. The advance guard of the Colossian armies had already seized the bridge-head at Coraz, over the Gigas River. The great mass of troops was still on the eastern or Colossian side of the broad river. They never crossed it. Two squadrons of Hyderabads and Hinaidis destroyed the bridge in a night attack. At dawn next morning the advance guard, now isolated, was attacked by the Fairey Foxes and Horsleys of other British bombing squadrons. The story of the Turkish 7th Army and its fate on the Nablus-Jordan road on October 21st, 1918, was repeated. There was a rout, a disaster. The spearhead of the Colossian attack was destroyed.

The other bridges met a similar fate. The southern bridge, with its important railway lines, was reduced to a tangled mass of steel and masonry by the bombs of the Italian Capronis of the international air force. French Bréguet and Lioré et Olivier bombers dealt faithfully with the great central bridge before the Colossian divisions advancing by that route had even approached it. The net effect of the bombing attacks was that the only three lines of communication between Colossia and Urbania were lines of communication no more. Repeated attempts to throw pontoon bridges over the river failed in the face of the League's aircraft raids. The huge Colossian hosts were checkmated, held in a vice at the frontier, impotent to advance. Nor could the balance be restored in the air. The Colossian fighting aircraft were hounded out of the sky by the preponderant fighter units of the League. The Colossian bombing formations, aerodromes and anti-aircraft defences were systematically harried at the good pleasure of the allied air forces.

Having overcome the aircraft and anti-aircraft opposition, the squadrons of the international air force turned their attention to other targets. They wasted no time or bombs on the Colossian armies, powerless to advance, innocuous where they stood. It was at the bases of Colossia's armed strength, at the sources of armament and revictualment that they struck. The magazines, depots, arsenals, supply centres, munition factories, strategic railway junctions, and naval bases were their objectives. The great petrol and fuel oil installations went up in flames. Relentless bombing attacks reduced the whole machinery and network of the supply system to chaos. The nerve centres of the Colossian military organism were systematically, scientifically destroyed. Nothing of the kind had been seen before, for never in war had it been possible to bring the concentrated, converging, perfectly synchronized attack of enormously powerful air forces to bear

upon all the military objectives of a single state. It was the first great revelation of the real meaning of air power, and it startled the world with the echoes of

> . . . *the thunder of a war,*
> *Foughten long since by giant Hierarchy*
> *Against rebellion.*

The allied squadrons left the great cities alone. To have turned them into charnel-houses would have been but little consonant with the high purpose of the League's intervention. Not bloodshed but disarmament was the object sought. The sword was to be struck from the aggressor's hand; that accomplished, the end was accomplished. Slaughter is only the means to an end, and air power has better and surer means for reaching that end. It can disarm " at source."

Actually, without mass slaughter, the end was reached which in modern times has been attainable only through mass slaughter. Military overthrow, as complete as if the Colossian armies had been destroyed in battle, was, in fact, achieved when, as a result of the concentrated attack in overwhelming strength from the air upon their only possible lines of advance into Urbania and all their bases of supply and lines of communication, they were reduced to immobility and helplessness. A further problem still remained, however—a problem as yet unsettled in war. It was whether the new kind of military overthrow so achieved would suffice in itself to bring Colossia to terms, or whether it would have to be followed by further measures of coercion. That was the doubt.

The Colossian government gambled with fate on the doubt. It remembered the principle of Von der Goltz that after the enemy's fighting strength has been broken there still remains a separate and, in certain circumstances, a more difficult task to be accomplished—the breaking of the enemy nation's will to war. In the past that further object could usually be achieved—at any rate in an "unlimited" war—only by means of the military occupation of the defeated's state's territory. Now the Colossian Cabinet knew that while the League had an international air force it had no organized land forces at its disposal. It knew that time would be needed to assemble and co-ordinate the national contingents which would be required to form an army of occupation. Meanwhile a way might be found to retrieve the initial disaster and to pull victory out of the jaws of the defeat in the air.

So, bewildered, reeling, staggering though it was under the blows of air power, the Colossian government took heart to continue the apparently hopeless fight. It returned a defiant answer to the League's demand for an immediate cessation of hostilities, demobilization and the payment of indemnities for the " war " expenditure incurred by the

League. It reiterated the claim that Colossia was acting strictly in self-defence. It reaffirmed her son's determination to fight to the last ditch in her righteous cause.

The League's reply showed that the bolt of air power was by no means shot as yet.

Unless, it stated, within twenty-four hours Colossia signified her acceptance of the League's terms, the following action would be taken:—Certain closely defined areas, the names and situations of which were set forth, would be bombed between specified hours, and the Colossian government was advised to make arrangements for the complete evacuation of the areas in question by that time. For any failure to give heed to this warning, and the inevitable casualties that must result, the League, it was stated, could take no responsibility and the Colossian government must be answerable alone. The areas named were the perimeters of the most important electricity and gas-works of the country, the larger waterworks, the isolated wireless stations, dock gates, bridges of national importance, extra-urban engineering works, and other self-contained factories of large extent, not falling necessarily within the definition of military objectives. All the establishments in question were so situated that, given the evacuation counselled and given also the fact that all opposition to the League's air forces had already been overcome and that they were free to bomb from low altitudes and with precision, bombardment of the objectives should have been practicable without resultant loss of life. On the other hand, it would be bound to create conditions in which the ordered life of the community would no longer be possible, and a degree of disturbance and disorganization far surpassing anything to be feared from an ordinary military occupation would inevitably result. Great urban communities would be deprived of light, water and power. Their streets would be plunged in darkness, their train and tram systems immobilized by lack of current, their organization of distribution and intercommunication paralysed, the amenities of everyday life destroyed. Chaos and pandemonium could hardly fail to follow in the poorer and more densely populated quarters of the larger towns, and something like revolution was to be feared when the submerged masses realized the helplessness of the government and their own opportunities.

The government hesitated. The situation had developed in a way not foreseen. Counsels in the Cabinet were divided. Some Ministers saw no choice but submission, others pressed for continued resistance in the face of all consequences. The latter might possibly have prevailed, at least for a time, if events had not passed beyond the government's power of control. Very soon after the wireless message conveying the League's ultimatum had been dispatched to the Colossian

government, thousands of copies of it were dropped by the League's aircraft throughout Colossia. The result was an immediate and universal demand that the population should be spared the calamities foretold. Great popular meetings were organized to express this demand and clamorous crowds pressed its acceptance upon the Cabinet. In the industrial centres the demand passed, indeed, beyond orderly petition. There was talk of revolution, of the barricade and the scarlet cap. The verdict of the nation was unmistakable. The will to war was clearly broken. The Colossian Cabinet saw no course but to submit. It accepted the League's terms.

The new system had justified itself. It had won a resounding triumph at its first trial. The international air force had proved itself an effective international fire brigade. It had smothered at the outbreak a fire which might well have been fanned into a world-wide conflagration comparable to that of 1914-18. It is a wonderful story, that which tells of the prompt, smooth, practically bloodless intervention of the massed air forces of the world in this first great crusade in the name of peace. A wonderful story, but a story of dreamland. Why it could be only a story of dreamland and not one related to the grey reality of our quotidian world is shown in the second part of this veracious chronicle.

(*To be continued.*)

SOME NOTES ON PREPARING FOR THE STAFF COLLEGE

(Continued from Vol. I, No. 2, page 261.)

BY WING-COMMANDER R. GRAHAM, D.S.O., D.S.C., D.F.C., *p.s.a.*, R.A.F.

III.

WRITING.

"*Form the habit of expressing thoughts in writing, because an idea which may seem fairly clear when thought about often becomes extremely illusive when an attempt is made to transfer it to paper.*"

THE IMPORTANCE OF THE WRITTEN WORD.

A STAFF officer must be able to express his thoughts simply, clearly, accurately and concisely on paper because his duties are primarily concerned with the preparation of appreciations, memoranda, orders, instructions, reports, messages and all forms of correspondence. Yet many people within the Services look upon the written word, for which they have a more expressive term, as a waste of time. To adopt such an attitude towards paper-work in general is ridiculous, because the written word must be the main co-ordinating medium within a scattered and ever-changing community like a modern fighting service. Perhaps these extremists feel that if Moses had not committed himself to the written word life to-day would have been a more pleasant affair. There is cause for justifiable criticism, but the fault lies in the manner in which writing is abused through carelessness or lack of interest or experience, and not through any fault of the system itself. Any system can be ruined by those who put it into practice.

Quite apart from Staff duties, it is an accepted fact that practice in writing forms an ideal method by which to train the mind. Since a Staff officer must have an orderly mind, it follows that the written word should form the basis of all Staff training. In order to become proficient in Staff duties, the candidate for the Staff College cannot start too early to practise the craft of writing simple, clear, accurate and concise English. The paragraphs that follow are an attempt to outline for the beginner a well-tried method of preparing written work. A few notes on composition have also been added.

It is important to bear in mind that this article is intended to start candidates in the right direction. As a candidate becomes more proficient he will find that rigidity has no place in written work; alertness and flexibility are the important attributes of mind required for good Staff duties. There are so many possible contingencies when considering a complex problem like Staff duties that it is impossible to legislate for all of them in a short article like this. Only continual practice will clear the air.

The Writer must have a Definite Aim.

Before attempting any piece of writing, the first essential is that the writer must have his aim clearly in his mind and he must keep it there throughout the preparation, writing and revision of his paper. It is as well to write the aim in block capitals on a separate sheet, so that it will not be forgotten. If the aim is overlooked, even for a moment, the subject matter suffers.

The Collection of Material.

Having made up his mind that he has something definite to write about, the writer must then set about collecting the material for his paper. He must rack his mind for all he knows about the subject he is dealing with, and as each point returns to him he should transfer it to paper. The beginner should jot his points down one after the other as they occur. As he becomes more experienced he will be able to write them down in their order of importance and in the sequence in which he intends to use them, but for the purpose of this article the outline plan and the collection of material will be considered as separate stages in the preparation of a paper.

The Outline Plan.

The writer must next decide upon his outline plan. From his collection of material he must select points of major importance or key ideas appropriate for his purpose and must arrange them in a logical sequence. The selection and arrangement is not an easy matter, and the writer will often find difficulty in completing his paper without some adjustment to the selected framework. The beginner should try to adhere to his original plan, but if, when writing, his mind tends strongly to depart from the selected arrangement, it is an indication that the framework requires reconsideration; lack of a definite framework may lead the writer away from his aim or from a proper valuation of the various aspects of the problem, with the result that the paper will not hold the reader's attention, or will fail to convince him of the soundness of the arguments advanced.

The Selection of Material.

The writer is now in a position to select from his collection of material the facts and ideas for his outline plan. At this stage he should direct his attention towards the idiosyncrasies of the reader or readers he has in his mind, because he must select and serve up the material best suited for his purpose. In this connection a Staff officer has frequently to put himself in the place of his commander, as well as in the place of the person or persons for whom the commander requires the paper.

Detailed Arrangement of Selected Material.

The selected facts and ideas can now be fitted into the outline plan to form a logical sequence of thought throughout the paper. When an argument is necessary it should be set out in a definite and forceful manner so that it will progress with accumulative and irresistible force, like a wave, towards the desired conclusion. An argument need not be elaborate and it should not be laboured. The best result will often be achieved by starting with facts and making simple and obvious deductions from them.

An argument should fulfil the following three conditions:—

(a) *It must be complete.* Sufficient points must be developed to make the argument sound and convincing, but too many points will make it tedious for the reader. In this respect it has been likened to a chain stretching from one holdfast to another; if one link is missing the chain will not hold anything, and if surplus links are inserted the chain will be loose.

(b) *Each point in an argument must be relevant.* Sections 41-43 of Chapter IV of the Manual of Air Force Law should be studied in this connection; they deal with the principles of evidence.

(c) *All the points in an argument must be arranged in logical sequence.* The sequence may be one of time or one of relation of ideas. In this respect an argument has been likened to an evenly flowing stream bearing a raft, upon which is seated the reader; smoothly and without sudden change of speed he is borne without effort on his own part from the start to the end; the speed of the stream governing the amount of detail to which his attention may be reasonably drawn.

Candidates who have not studied logic will undoubtedly derive benefit and save themselves considerable trouble by studying an elementary text-book on the subject. The following extract from "Jevon's Logic," page 8, is of interest:—

"To say that men can reason well without logical science is about as true as to say that they can live healthily without medicine. So they can—as long as they are healthy; and so can reasoners do without the science of reasoning—as long as they do reason correctly; but how many are there that can do so? As well might a man claim to be immortal in his body as infallible in his mind."

Final Drafting.

The process of expanding the detailed framework of material into a finished draft may be conveniently considered under five headings: Introduction, Paragraphing, Language, Some Pitfalls, and Conclusion.

Introduction.—The introductory paragraph requires careful consideration. In some instances it may be unnecessary and therefore better omitted, but in many papers an introduction is desirable to indicate the scope of, or the reasons for, the paper. A good introductory paragraph will arouse the reader's interest and will focus his mind in the right direction, thus making him better able to follow and absorb the paper as a whole. In this respect an introductory paragraph will often decide, by its effect on the reader, the ultimate fate of the paper. When used to indicate the reasons for a paper the introductory paragraph should be interesting, concise and to the point, and when used to indicate the scope of a paper it should be a brief but true indication of what is to come.

Paragraphing.—Paragraphs should be numbered, and, except in letters, should have headings. These may be sub-headings used to cover one or more paragraphs, or they may be paragraph headings, which should be set into the first line. Each paragraph should start a new phase of the subject and should deal only with that one phase. The subject matter of a paragraph should carry the reader forward along the line of thought, and all the paragraphs should be linked together to make a continuous thought sequence throughout the paper.

Language.—The language used reflects the state of the mind. If a paper is woolly or unordered, the reader is justified in thinking the same of the writer's mind; if it is clear and well ordered it will carry conviction and be appreciated. The generally accepted canons of good writing have been laid down by the late Sir Arthur Quiller-Couch in his "Art of Writing." They are: Perspicuity or Clearness, Accuracy, Appropriateness and Persuasiveness.

(a) *Perspicuity or Clearness.*—"The first aim of writing is to be understood. The more clearly you write, the more easily and surely will you be understood." In practice this means that words and phrases must be carefully chosen. Ambiguity is a crime.

(b) *Accuracy*.—The writer on technical subjects must needs be accurate both in fact and expression. A machinist who worked only to 1/100th of an inch where 1/1,000th was necessary would be an inaccurate workman, though the layman might consider the difference not worth bothering about. The same degree of accuracy called for in the machine should be aimed at in the use of words. A writer should avoid a multiplicity of words, sweeping statements and generalization. He should develop accuracy by inquiring into his own statements and by being certain of his facts. Inaccuracy results from laziness or carelessness. It is wrong to say " individual " or " person " when " man " is meant. " Machine " should not be used in place of " Landplane," " Aeroplane " or " Aircraft."

(c) *Appropriateness*.—This rule demands that words, phrases and sentences must be in harmony with the subject. Poetical phrases would be out of place in an Operation Order. In the same way a letter to a civilian who has complained about low flying would be different in tone from that sent to the pilot responsible for the complaint. Language must be suited to the occasion and person. "His manner of writing, considering what he had to say, and whom he had to say it to, could not be bettered."—(Newman.)

(d) *Persuasiveness*.—The observation of these rules is for one object, namely, to persuade the reader that what is written is right or worthy of his attention. It is not of much use to have a good argument if it is expressed loosely and unconvincingly. Written accurately, clearly and fittingly, it will produce a vivid and forceful treatise that will compel the attention of those who read it. To this end the following rules will help:—

(i) Prefer the concrete word to the abstract. " The man hit his wife on the head with a poker " tells a definite story. To describe the incident as " The man treated the woman with unmistakable brutality " is vague and general; one asks immediately, " Who was she?" and " What did he do?"

(ii) Prefer the direct word to circumlocution and the familiar word to the far-fetched.

"He went through the usual movements preparatory to taking the air " probably means " He tested his controls before taking off."

(iii) Generally use transitive verbs and use them in the active voice. For instance, in the sentence, "The boy killed

the rabbit" one sees vividly the action, the killing, but in "the rabbit was killed by the boy" one has only a vision of a dead rabbit.

(iv) Prefer the short word to the long, *e.g.*, "A knowledge of the sea" is better than "A considerable acquaintance with maritime affairs."

(v) Make constant use of a dictionary. Define a word and then look it up. This is the best way in which to build up a vocabulary.

(vi) Quotations properly used add force to one's writing, but great care must be used in choosing them. They should be used sparingly and should be of acknowledged authority. Quotations should appear with inverted commas, and the authorities, volume, edition and page should be cited on the same page, *e.g.*, "The object of elaborate composition is not to multiply words, but to select them—not to luxuriate in copiousness or variety of expression, but to condense and chasten, and to lop away all that is meaningless or redundant. The thought must germinate the words."—(Chalmers' "English Prose," 2nd Edition, page 456.)

(vii) *Punctuation.*—If long and cumbersome sentences are avoided, few punctuation marks will be needed, except full-stops and commas. The modern practice is to use commas sparingly. Where common sense says that a comma would be useful in breaking a sentence so that the eye can more easily follow it, there put one.

(viii) Observe the rule of proximity and ring the changes on periodic and loose construction.

Some Pitfalls.—The following pitfalls frequently catch the unwary, and are worth bearing in mind.

(a) Avoid split infinitives, unnecessary conjunctions, superfluous adjectives, superlatives, slang and unnecessary foreign words.

(b) Avoid a succession of long sentences. The short sentence is simpler and clearer, therefore better. A long string of short sentences is jerky and monotonous, therefore vary the length of sentences but on the whole aim for brevity.

(c) Consider twice before writing "I think." The reader takes it for granted that what is written is what is thought. The phrase "I think" or any implied variant of it such as "perhaps,"

"probably," "let us consider," "likely," "we find that" gives a paper an apologetic air. Their frequent use should be avoided. They should be used only when they fulfil a definite purpose. They will be found useful when tact is necessary.

(d) *Journalese.*—Much criticism has appeared concerning the faults of journalistic writing. In good papers one will find good English. The cheap journalist is he who has little to say but wishes to impress. He uses fine-looking words and phrases, which are airy and woolly. When closely examined they are non-committal and mean nothing. His style is to be avoided.

(e) Avoid unnecessary repetition. It is not a fault to repeat good words. In a paper on "Engines" the word "engine" will appear many times. It would be weak to vary it by using the word "machinery" or "machine." The repetition of unnecessary words is the fault.

Conclusion.—The concluding paragraph of a paper may fulfil one of three purposes. First, it may be used to gather together the several threads of thought in the paper so that the material as a whole is neatly and firmly connected to a definite conclusion. Secondly, it may be used as a summary to give the reader a comprehensive view of the various points brought out in the paper. Thirdly, it may be used to put forward or to summarize recommendations based upon the investigation carried out in the paper. In all three uses, however, the conclusion should not contain any new matter, but should hinge entirely upon what has been brought out in the body of the paper. An after-thought inserted in the conclusion instead of in its right place in the paper is likely to create a bad impression and may even neutralize good effects produced by the preceding paragraphs.

Revision.—All written work must be thoroughly revised before it is issued, because errors invariably creep into the original manuscript. A careful revision will eliminate loose phrases, ambiguities, unnecessary and misused words, and wrong punctuation. Moreover, it will catch omissions. Some writers leave their work for a time before revising it, but a Staff officer will seldom be in a position to do this.

If possible, the work should be read aloud. Reading aloud is useful for testing the sentence accent. "A writer who cannot trust himself to balance his sentences properly should read aloud all that he writes."—(Fowler, "The King's English," page 296.)

When dealing with long or complicated papers the criticism of another mind will be invaluable, especially if it is followed, as it should be, by a final revision at the hands of the writer.

"The common foundation of excellence in all forms of writing is

producing on the mind of the reader an impression which the writer intends to convey. That is the supreme test."—(Mr. Winston Churchill, *The Times*, November 13th, 1929, page 9.)

Conclusion.

In conclusion the following points, already dealt with in Part I of this series, are repeated in the hope that they will encourage officers to start preparing for the Staff College early in their careers:—

"The principal object of this examination is to find out whether they (the candidates) have the attributes necessary for the making of a Staff officer. The examiner wants to find the candidate who can show the correct relation between facts, can make sound deductions and produce his ideas in logical sequence and concise form.

Candidates must therefore practise thinking over what they read in such a way that reading becomes a means of originating thought. They should then form the habit of expressing these thoughts in writing."

What is required of a candidate is the power to form and express opinions on problems, such opinions being based on a knowledge of the causes governing such problems. Leaving out the genius, this power can be obtained only through careful and prolonged preparation. One cannot start too early in one's career. Lack of preparation may lead a candidate into the predicament in which Omar Khayyam found himself:—

"Myself when young did eagerly
frequent,
Doctor and Saint, and heard
great Argument
About it and about; but
evermore
Came out by the same Door as
in I went."

(*Concluded.*)

THE USE OF MODELS IN AERONAUTICS

By A. E. Woodward Nutt, B.A.

I

Of all branches of engineering, aeronautics furnishes the outstanding example of the use of models. It cannot, however, claim to be the pioneer in this respect, for models were used as a guide to full scale design long before the days of aircraft, notably in naval architecture. But aeronautics has now surpassed even naval architecture in the variety and extent of the uses to which models are put, and as far as other branches of engineering are concerned experimental model work is still in its infancy. On the other hand, the success that has attended the use of models in aeronautics has caused a definitely increased interest among engineers generally in the principle of the experimental scale model.

From the earliest days of aeronautics models have played an important part. In fact, the first recorded flight of a power driven heavier-than-air-craft is believed to have been that of a steam driven model aeroplane made by John Stringfellow at Chard, Somerset, in 1848. Many of the early pioneers, including the Wright brothers, experimented with models before venturing to build man-carrying machines. The Wrights even conducted tests in a crude form of wind tunnel.

Most of the existing data in aerodynamics have been obtained from tests made on models in laboratories. In fact, it may be said that the final design of every aircraft in existence to-day is directly or indirectly due to model experiments.

The reason for this is not far to seek. Unlike any other form of locomotion, with the exception of the submarine, an aeroplane can move freely in three dimensions. It is completely surrounded by air, and the forces sustaining and moving it are entirely due to the way in which the air is made to flow round it. The theoretical calculation of this flow of air is so complex a problem that, except in a few simple cases, it is quite outside the range of present-day mathematics. The only way, therefore, in which to collect information about aircraft is by means of experiments on either full-scale machines or models.

Some experiments cannot be done on aircraft in flight. Tests on the separate components of aircraft are a case in point. The only practicable way of obtaining information about the behaviour of wings,

bodies, propellers, and other parts of aircraft separately is by testing models in a current of air.

Other tests must be done on models in the interests of safety. Time and again have model tests shown that some new design, or some modification to an existing design, would be dangerous in the full-scale aircraft, and have enabled the fault to be rectified before the machine was constructed. Often they have shown how some vice possessed by a particular type of aircraft could be eliminated.

One of the most important advantages offered by model experiments is, of course, cheapness. Apart from the obviously lower cost of a model as compared with a full-size aircraft, the cost of the necessary equipment, the running costs, the amount of labour required, and the duration of the experiment are all relatively small. This makes the total cost of a model experiment a fraction of that of the corresponding full-scale test.

Again, the time factor is frequently important in experimental work, and the model scores heavily here. Not only does the actual constructional work take less time, but a full-scale test may have to wait for suitable weather. A model experiment can often be done in as many days as the full-scale test would take months.

In model experiments great precision of measurement is possible and an exact repetition of any observation can always be obtained. The same cannot be said for full-scale tests. In the cockpit of an aeroplane in flight the conditions are by no means conducive to highly accurate measurements, nor can very delicate instruments be used. Owing to the continually changing state of the atmosphere, the conditions for two consecutive full-scale tests are rarely identical. Hence the general accuracy of full-scale tests must always fall far below that attainable with models.

On the other hand, in model experiments there is always the question as to whether the results really indicate what would happen in the corresponding full-scale test. There is among aeronautical engineers—in common with their brothers in other branches of engineering—some tendency to regard the results of model tests with suspicion. This suspicion is not altogether unjustified, for undoubtedly discrepancies between predictions made from the results of model tests and the corresponding full-scale measurements have arisen. They arise still, though to a much smaller extent as experience in model testing increases. Many of these discrepancies have been traced to inaccurate representation of the full-scale object, or to an imperfect realization of the importance of some factor influencing the results. The rest can be attributed to what is generally known as " scale effect."

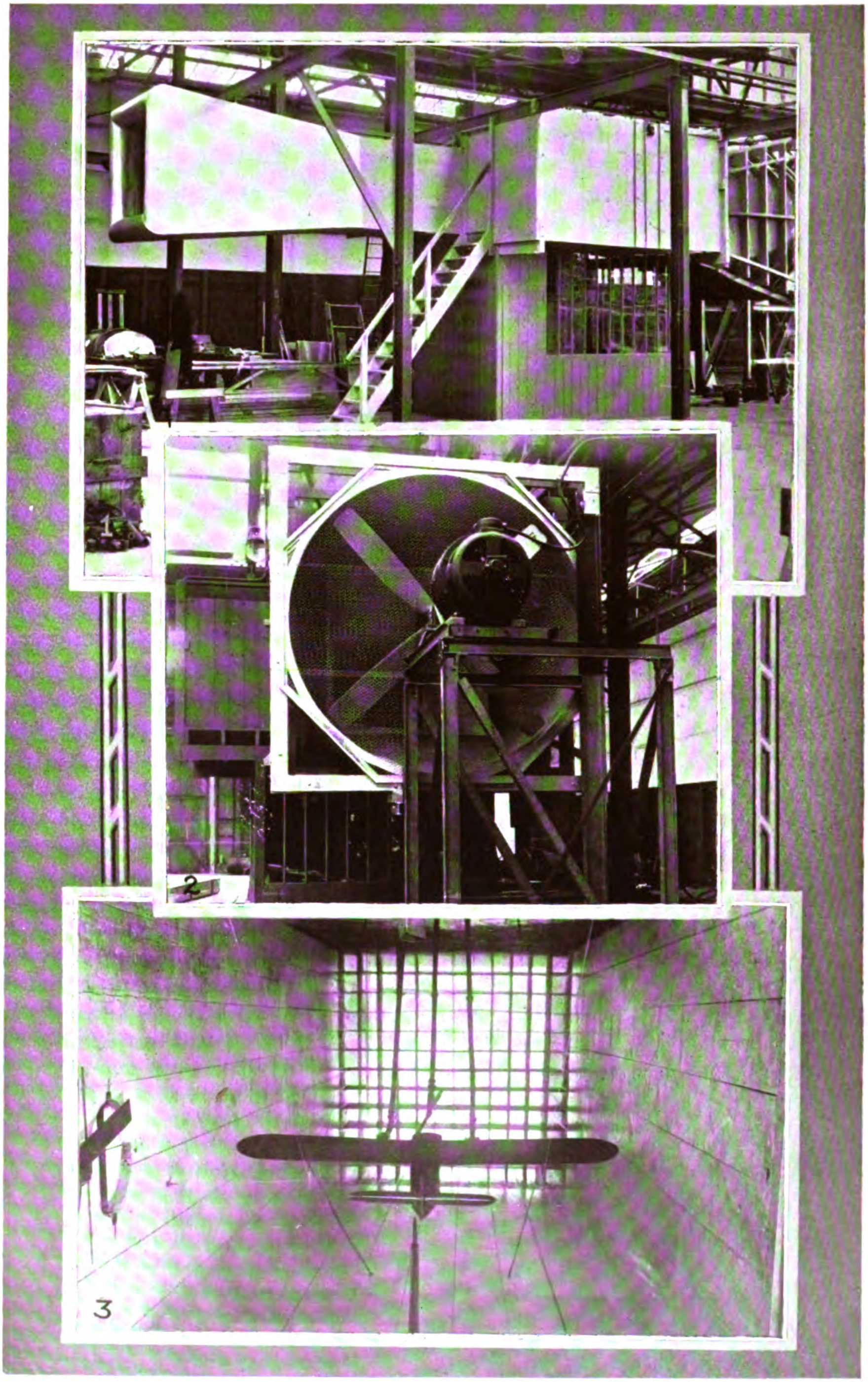
Scale effect is the chief bugbear of the model experimenter, and a large part of small-scale research is concerned with its detection and

measurement. It arises because in aeronautical work it is often impossible to get dynamically similar conditions between the model and full-scale experiments. For dynamical similarity, not only must the model be a geometrical reproduction of the full-scale object, but the flow of air round the two must also be geometrically similar.

The first condition demands considerable experience in the design of a model and extremely accurate workmanship in its construction. It is the second condition, however, which is difficult to attain in aeronautical research, for it implies that the speed of a model aeroplane tested under ordinary conditions must vary inversely as its scale. In other words, a 1/10 scale model of an aeroplane moving at 100 miles per hour must be tested at a speed of 1,000 miles per hour to give dynamically similar conditions. Speeds of this magnitude are impracticable. The power required would be enormous, and apart from this the compressibility of the air becomes an important factor at these speeds and would entirely vitiate the results. With the methods of testing at present in use in this country, the largest model of a normal-sized aeroplane that can be tested is 1/5 full size, most models being 1/10 scale or less. Dynamical similarity between model and full scale cannot therefore be obtained.

When qualitative results only are required from model tests this lack of similarity is not very important, for changes of any sort may generally be expected to have a similar effect on the full-scale aircraft and the model. As a great deal of model work is occupied in finding the effect of changes in design, this immunity from scale effect is fortunate.

As far as quantitative measurements are concerned the state of affairs is more uncertain. In some cases there is a considerable scale effect between model and full scale. In others there is practically none. The difficulty is to know when there is likely to be an appreciable scale effect, and to form some idea as to its magnitude in any particular case, so that model results may be suitably corrected. Much work has been done on this subject. A great number of tests have been made on a variety of objects ranging from simple spheres and cylinders to struts, wings, and airscrews and finally to complete model aircraft. These have been tested over a wide range of speed and scale, starting from tiny models at very slow speeds and ending with tests of full-scale aircraft in flight. Thus a great deal of data on the variation of scale effect with speed and scale have been collected. At first sight the way in which scale effect varies for different shaped objects appears to be entirely fortuitous. But this is not so in reality, and aided by the mathematical theories of fluid motion the technicians can now tell in most cases whether scale effect is likely to be serious, and often can predict its probable magnitude in any particular experiment. The



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4-FT. WIND TUNNEL AT THE WESTLAND AIRCRAFT WORKS.

1. View showing inlet end, and operator's offices at side and below.
2. Outlet end of Wind Tunnel showing motor and fan. Owing to the large size of the building containing the tunnel no distributor is considered necessary.
3. View inside Wind Tunnel looking towards inlet end, showing model in position, and honeycomb.

whole theory of model testing has now been placed on a sound basis, so that while care and judgment is required in applying the results to full-scale aircraft, it can usually be done with considerable confidence.

The chief method of testing model aircraft or their components is by means of a wind tunnel. This is essentially an apparatus for providing a steady current of air past a stationary model. The model is usually supported on balances by means of which the forces and moments acting on it may be measured.

The wind tunnel plays much the same part in aeronautical research as the Froude tank in naval architecture. There is, however, the essential difference that whereas in the Froude tank the model is towed through the water by a special carriage, in a wind tunnel the model is held and the air drawn past it. There are two main reasons for the adoption of this arrangement. First, it is much easier to make observations and take measurements when the model is stationary. Secondly, to reduce scale effect the relative speed between the model and the air should be as high as possible, and a steady condition of this nature is more easily obtained by moving the air past the model. The forces produced by the air on the model are the same whether the model is moving and the air still, or *vice versa.*

Wind tunnels are in use all over the world, from the U.S.A. in the West to Russia and Japan in the East. In England there are 20 in existence at present, eight of which are at the National Physical Laboratory at Teddington, and three at the Royal Aircraft Establishment, Farnborough. Of the rest, three are at universities and six aircraft firms have one each.

Though they differ a good deal in size and in detail the English tunnels are all of the same general type, known as the N.P.L. or "closed" type. This type of wind tunnel is usually square or rectangular in section over the main part, expanding to a kind of trumpet mouth at one end, and to a circular section at the other. A fan, very much like an aeroplane propeller, is mounted at the circular end and sucks the air in at the trumpet mouth and through the tunnel. After passing through the fan the air is usually led into a distributor, which is a large box with perforated sides through which it emerges at a slow speed. Just inside the trumpet mouth there is a kind of honeycomb of flat plates which smooths out the air flow. Sometimes there is a second honeycomb just before the end of the square section.

The whole structure usually stands in the middle of a large room, and is mounted on a steel framework. Common sizes of tunnel are of 7 ft. or 4 ft. square section over the main part.

The form of the distributor varies a good deal with different tunnels. Sometimes a perforated wall is built right across the room in which the tunnel is housed. Sometimes the distributor is dispensed with

altogether. In some tunnels the air, instead of being discharged into the room, is taken by means of a return tunnel or tunnels back to the other end again, being guided round the bends by vanes. The same air is thus used over and over again. In all cases very careful design is necessary for the air flow in the tunnel to be uniform and steady.

The model is mounted about half way along the tunnel. The forces and moments on it are measured by highly accurate balances situated either on the roof of the tunnel or underneath it. By ingenious design the same balances are usually made to serve a variety of purposes. The method of mounting the model often calls for considerable mechanical ingenuity, in order to give accurate results with the minimum amount of interference from the supports.

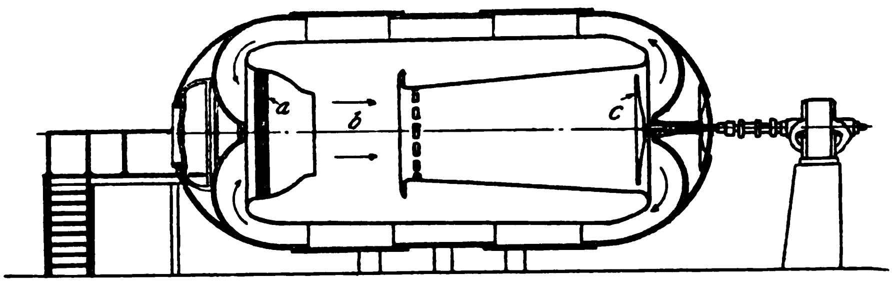
Access to the interior of the tunnel is obtained through a door in the side. This door usually has a large glass panel, through which the model can be observed while the wind stream is flowing. The wind speed is altered by varying the rate of rotation of the fan, the maximum wind speed attainable of course varying with different tunnels. In one of the 7 ft. tunnels at the Royal Aircraft Establishment a speed of nearly 100 miles per hour is attainable, with a 200 h.p. D.C. motor.

The largest wind tunnel in this country at the present time is that known as the Duplex Tunnel at the National Physical Laboratory. This is of rectangular section, 14 ft. by 7 ft. over the working portion, and is rather like two 7 ft. square section tunnels placed side by side with the adjacent walls removed. There are two fans, each of 11 ft. 6 in. diameter, alongside each other and revolving in opposite directions. These are driven by two 200 h.p. electric motors, and to get a steady air flow in the tunnel it was found necessary to synchronize the motors so that the two fans run at exactly the same speed. The maximum speed attainable is about 100 ft. sec. (about 68 miles per hour). This tunnel will take a 1/5 scale model of an aircraft of normal size, and a small electric motor can be mounted inside the model to drive its propeller. This cannot be done with smaller models, which have therefore to be tested with their propellers either freely rotating or fixed.

A different kind of wind tunnel is in general use on the Continent, though until recently it has not been regarded with favour in this country. This is known as the " open jet " type. These tunnels are generally of a circular section and are not continuous, the inlet and outlet cones being separate. The model to be tested is placed in the jet of air passing between the two cones. The other main features are similar to those for the closed type tunnels. Open jet tunnels have an advantage in the great accessibility of the model. Modern tunnels of this type are very efficient, and they are now tending to supersede the closed type.

In the U.S.A. there are a number of wind tunnels similar to those described. They also have what is known as a variable density, or compressed air tunnel.

From what has already been stated in connection with scale effect it follows that dynamically similar conditions between a full-scale aircraft and a model tested in an ordinary wind tunnel are impracticable. There is, however, a way out of the difficulty, and that is by enclosing the entire wind tunnel in a shell like a large boiler, and raising the pressure of the air inside. This makes the air in the tunnel denser than air at ordinary atmospheric pressure, and this increased



American compressed-air Wind Tunnel.
a. Honeycomb.
b. Space where model is mounted.
c. Fan.
The balances are not shown.

density of the air compensates for the small scale and low speed of the model. Dynamically similar conditions between a full-scale aircraft and a small model tested at low speeds can be obtained by raising the pressure of the air in the wind tunnel a few atmospheres. For example, if the pressure inside the tunnel is 20 atmospheres, a 1/10 scale model need be tested at a speed only one half that of the full-scale aircraft to get dynamically similar conditions and therefore no scale effect.

In the American compressed air tunnel 20 atmospheres pressure can be obtained. The tunnel is of the circular open jet type, the stream of air in which the model is tested being 5 ft. long and 5 ft. in diameter. A maximum wind speed of the order of 50 miles per hour is obtained with a 250 h.p. electric motor, the denser air needing relatively more power. The air discharged by the fan is taken round the walls of the shell to the inlet cone. The shell is about 35 ft. long and 15 ft. in

diameter. The balances are operated electrically, and there are peep holes in the shell through which readings may be taken and the model observed during the tests.

A somewhat similar compressed air tunnel is now being constructed in England for use at the National Physical Laboratory. It is to be rather larger and faster than the American tunnel, the air stream being of 6 ft. diameter. A pressure of 25 atmospheres will be obtainable. The provision of such a tunnel in this country has been in contemplation for some time, but was only finally decided upon after some representative British models had been tested in the American compressed air tunnel. The same models had previously been tested in our ordinary atmospheric wind tunnels, and full-scale tests on the corresponding full-scale aircraft had also been carried out. The tests had shown considerable scale effect in some cases. The tests in the American tunnel, however, showed such good agreement with the free flight tests that any doubts remaining as to the advantages of the compressed air tunnel were quickly dispelled.

The final design of the British compressed air tunnel was only decided upon after extensive tests on models of proposed designs. In fact, for any new design of wind tunnel or proposed modification to an existing design, tests of a model, sometimes in another wind tunnel, are made before construction is started. Thus the very instruments for model testing are themselves tested in model form.

Although most aeronautical model testing is done in wind tunnels, other methods are sometimes employed. Tests on flying boat hulls and seaplane floats are carried out in the William Froude tank at the National Physical Laboratory. This tank was originally designed for testing models of the hulls of ships, for which purpose it is still largely used. It is, however, the only means at present by which information as to the behaviour of seaplane floats and hulls can be obtained. The tank is a concrete basin 550 ft. long and 30 ft. wide, filled with water, and the model is suspended from a kind of travelling bridge or carriage and towed through the water. The carriage is large enough to carry the observers and equipment, and means are provided for measuring the forces on the model. Observations of points such as wave-making, and the cleanliness of running of hulls and floats are also obtained.

A maximum steady speed of 25 ft./sec. only is possible. While this is a little slow for seaplane work generally, it is not as serious as appears at first sight, for the conditions for similarity are different from those applying to a model tested in a wind tunnel. For models moving on the surface of water the flow will be similar to that for the full-sized object if the speed of the model is proportional to the square root of its scale. That is to say, for a 1/16 scale model, a speed of

20 ft./sec. is equivalent to a speed of 80 ft./sec. (about 47 knots) full scale. This, of course, makes similar conditions much more easily obtainable than in the case of models tested in a wind tunnel, especially when it is remembered that the speeds of seaplanes while on the water are low as compared with those of aircraft in free flight.

Owing to the increasing amount of this kind of testing, a special high-speed water tank is now being constructed at the Royal Aircraft Establishment. This tank will be considerably longer than the Froude tank at the National Physical Laboratory, but only 9 ft. wide. A speed of 40 ft./sec. will be attainable. This should enable models of marine aircraft to be tested under conditions similar to nearly all those arising in practice.

Another method of testing models, which is still used to a small extent, is the "whirling arm." This consists essentially of a structure on which a model may be mounted at the end of a long cantilever arm which is caused to rotate in a horizontal plane, so that the model describes a circular path of about 30 ft. radius. The whole is housed in a large room. Complicated arrangements are necessary by which the forces acting on the moving model may be measured at some point in the room. A great drawback to the whirling arm is the fact that the disturbance of the air in the room caused by the passage of the arm has not time to die down before the arm comes round again, and this seriously affects the results.

A few experiments have been made by dropping light models from a height and taking observations during the descent. The short time available and the difficulty of making measurements in a freely falling model have prevented the wider adoption of this method. There are, however, signs of a revival of interest in the method.

It has only been possible to mention some of the reasons for the use of models, their advantages, and some of the attendant difficulties. Nothing has been said of the countless experiments in which successful use has been made of them. It is hoped, however, in a subsequent article to describe some of the ingenious methods involving models which have been used in attacking, and in some cases solving the outstanding problems in aeronautics.

Model tests have the advantage of cheapness, speed, accuracy of measurement and safety, as compared with tests on aircraft in flight. They have definite limitations, and full-scale tests will always be necessary, both as a check on the conclusions of model tests and for some experiments where model work is impracticable. But for the collection of data, the prediction of performance and the testing of new departures in design, there is every likelihood of their being even more extensively used in the future.

(To be concluded.)

CLOUD AND FOG FLYING

By Major C. J. Stewart, O.B.E., Wh.Ex., F.R.Ae.S., M.I.M.E.

I.

From quite early times and long before man had flown, imaginative writers had allowed themselves the liberty of producing machines and men from the clouds to hurl destruction upon a terrified terrestrial population. Later the scientist, engineer and pilot conspired to make it possible to carry out this imaginative scheme—if there should be no other alternative—but whether the terror of the surface people exceeded the terror of the airmen when the clouds happened to be very low is a point on which no statistical data is available. That the experience of flying on an aeroplane at an essential speed of, say, 60 miles per hour or more in an atmosphere with a visibility extending to the wing tips or less, and in the neighbourhood of such solid things as trees, buildings and hills, sometimes alarmed the pilot may be accepted without question. It is hardly possible to conceive an experience more nerve-racking than flying in a hilly district with clouds obscuring the ground, and being unable to locate a suitable landing ground. It would seem, therefore, from such conditions, as though fog and clouds were to a great extent a protection against attack from the air. With the progress of the art of instrumental flying, *i.e.*, flying by the indications of instruments in the absence of a visible horizon, it is likely that clouds, far from being a safeguard against air attack, offer the attacker the best protection he can expect against air or ground defence. Indeed, with the advent of automatically controlled and radio-directed aircraft, it becomes difficult to imagine any feasible and adequate protection against air attack directed against fairly large areas such as a city. Both the daily press and the technical press have kept us tolerably well informed as to the progress of automatically controlled aircraft, and the radio-directed aircraft, as distinct from the compass-directed aircraft, has been for some time a daily feature of aviation, particularly in America, where there is a large number of radio beacons for assisting the navigation of aeroplanes. The problem of cloud flying is more readily solved than that of flying in fog, since the latter necessitates instrumental means for identifying a landing ground, and ultimately alighting on it.

Early experiments in cloud flying were carried out with the aid only of the normal flying instruments such as the air-speed indicator, revolution indicator, altimeter, cross level and compass, with the result that frequently the pilot found himself emerging from the cloud in a spin. The reason for this is not far to seek, since none of the instruments named can serve as a guide to the attitude of aircraft. The cross level, which was assumed to show the lateral attitude of the aircraft, is in effect a gravity controlled pendulum and will indicate merely the direction of the apparent vertical, which is not a sufficient guide to the correct manipulation of the controls of an aeroplane. The two main purposes for which an inclinometer on an aeroplane may be required are:—

(*a*) To indicate small disturbances from a steady state so that the pilot may, by operating his controls, limit such disturbances.
(*b*) To indicate the attitude of the aeroplane during steady flight.

The ordinary gravity controlled inclinometer is of little use in cloud flying for either of these purposes, since it does not indicate the inclination of the aeroplane unless the motion is steady; and this state cannot be attained unless purpose (*a*) is fulfilled. The limitations of the gravity controlled inclinometer are, however, substantially overcome by the use of such instruments as the gyroscopic pendulum, invented by Lanchester. For flying in cloud or fog it is desirable to have on an aeroplane a system of axes which remain fixed when the aeroplane rotates, and to which these rotations may be referred. Such a system, even though not exact, supplies the information necessary to the pilot to enable him to achieve steady flight; and where precision flying is needed, such a system, if exact, is of the greatest value. Perhaps the most useful axis to define is the vertical, and numerous attempts, more or less successful, have been made to produce a gyro-vertical, *i.e.*, a vertical line gyroscopically maintained.

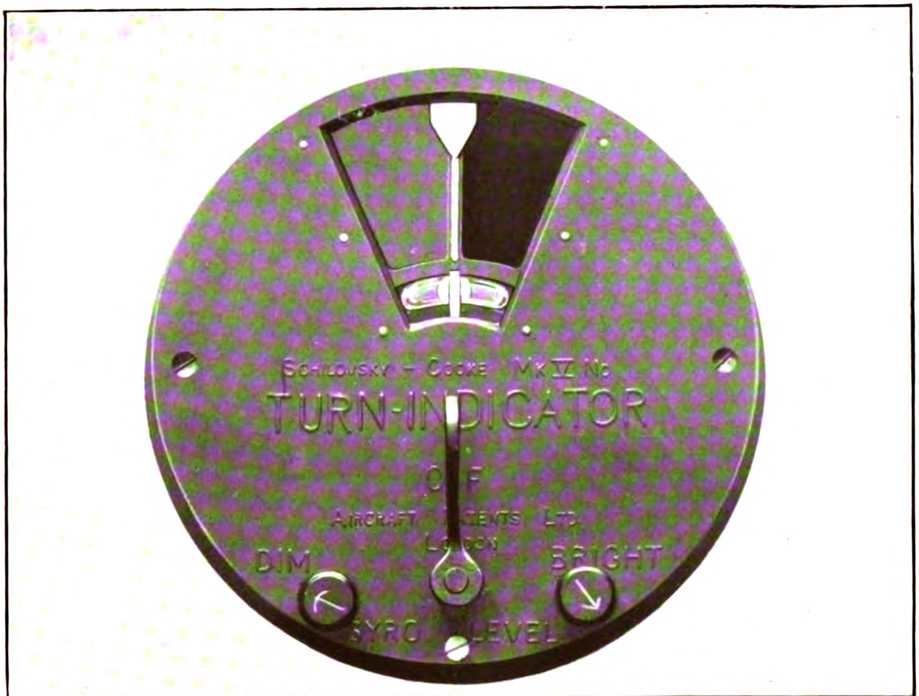
Sufficient has been said, then, to indicate broadly the kind of instrument equipment necessary on an aircraft to enable navigation in cloud, as distinct from fog, to be achieved. In practice, it is usually sufficient to carry only one instrument—the turning indicator—in addition to the normal flying equipment, to enable flights to be made in cloud without danger. Such an instrument has two functions to perform, namely, to indicate to the pilot a turn off course, and to give such indications that, should he inadvertently get into a spin, he may regain level flight without the aid of a visible horizon. It should be remarked that although the compass will indicate turns off course, it will not give reliable indications when the aeroplane begins to rotate, particularly when on a northerly course. Much of the danger in early cloud-flying experiments was due to the misleading indications

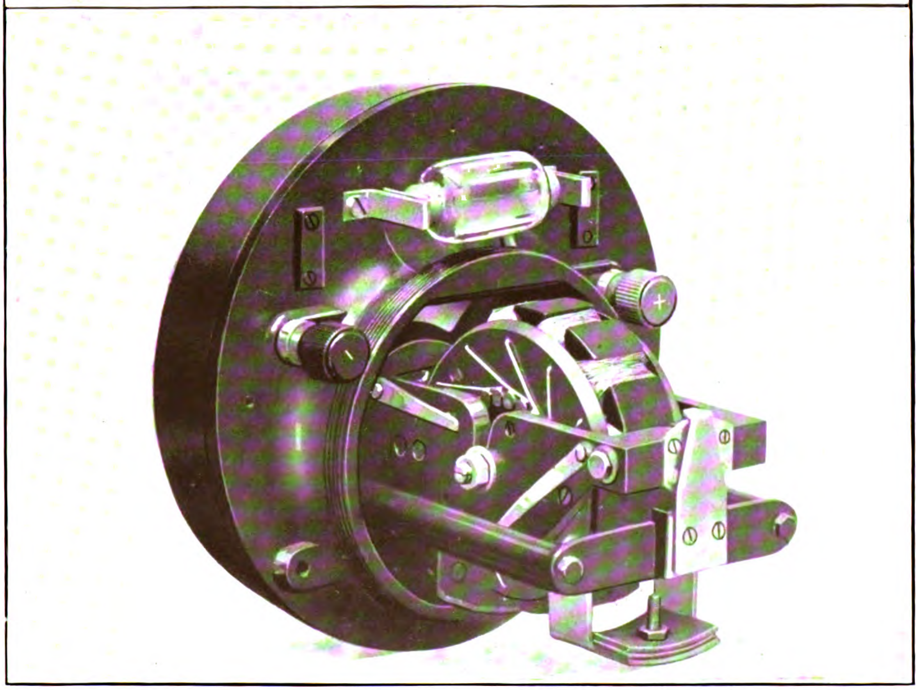
of the compass. When turns are made in cloud in accordance with the indications of the turning indicator, the compass can, however, be relied upon to indicate the direction in which the aircraft is flying, and in consequence the two instruments should be used together. Before describing a typical turning indicator, it may be remarked that gyroscopic instruments of the spinning top type have been used with some success for cloud flying, but in general they do not maintain their axis of spin with sufficient accuracy for any length of time, and they are disturbed by violent turns.

For this reason, a form of gyroscope in which a rotor is mounted in a frame pivoted in the fore and aft axis of the machine and restrained by a spring or weight, so that when the aeroplane is turned in azimuth the frame is tilted against the spring, has been developed with satisfactory results in this and other countries, notably by Sperry in America, and Reid and Schilovsky-Cooke in this country. Figures I and II show a Schilovsky-Cooke instrument. This comprises a lateral inclinometer and a turning indicator, contained in the same case but quite independent of one another in action. The lateral inclinometer is merely a pendulum having an air-damping cylinder with an adjustable leak. The turning indicator consists of a small direct-current motor forming the rotor of the gyroscope which rotates about an axis set athwartships in the aeroplane. The rotor is carried in a pivoted frame which is gravitationally controlled and is supported on knife edges arranged at right angles to the rotor axis. A movement of the aeroplane in azimuth causes the gyroscope frame to tilt about the fore and aft axis, and this movement is indicated to the pilot by means of a coloured screen secured to the pivoted frame. This coloured screen works against a screen carried by the inclinometer, a red light being shown for a port turn and a green light for a starboard turn. This assembly prevents a sideslip being indicated as a turn.

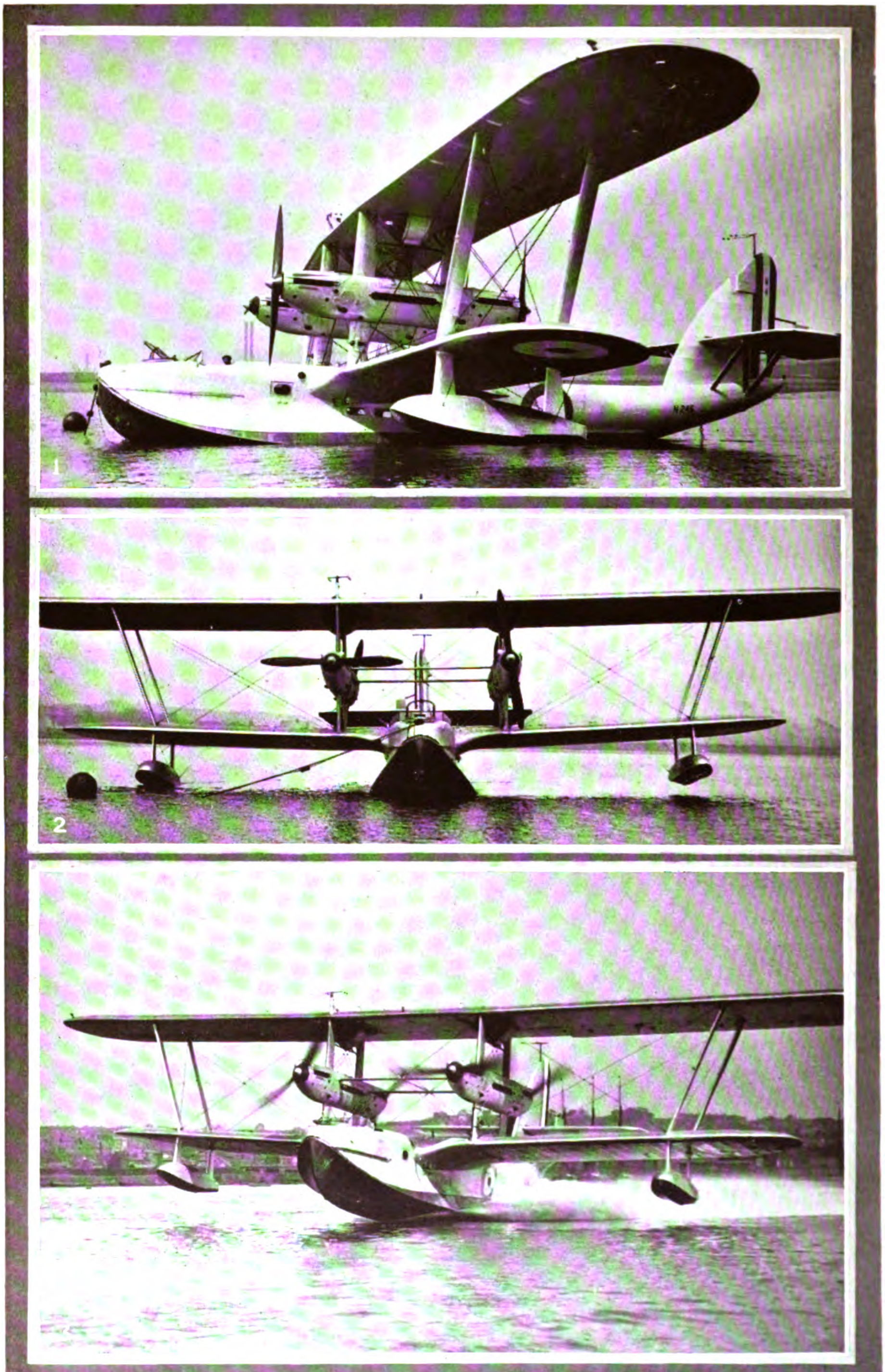
In a correctly banked turn the inclinometer pointer remains central with respect to the case of the instrument, while the coloured screen and the marked pointer thereon move in the direction of the turn. In a pure side-slip the inclinometer pointer and the gravity-controlled gyro pointer remain in the same position relative to each other, while the case follows the movements of the aircraft.

Another gyroscopic instrument recently constructed by the Sperry Gyroscope Company of America serves as a satisfactory cloud-flying instrument. This maintains, by means of a gyro vertical, an artificial horizon in the aircraft working against a blue and grey background to represent sky and ground, and having in front of it a silhouette of an aeroplane. Pitch and bank of the aeroplane are thus easily read in the absence of the natural horizon. The casing of the vertical





THE SCHILOVSKY-COOKE TURN-INDICATOR



THE SHORT SINGAPORE MARK II ALL-METAL BOAT SEAPLANE.
Fitted with Four Rolls-Royce F.XII M.S. Engines.

gyroscope is mounted in a gimbal ring which is pivoted to the instrument case about the longitudinal axis of the instrument. The sky-earth background of the instrument face is attached to this gimbal ring, and therefore tilts with the gyroscope and the horizon. The horizon bar is carried by a link from the rear part of the gyro casing through a pivot on the gimbal ring and thence out in front of the sky-earth field. This reversing linkage corrects the horizon motion to the normal apparent motion of the real horizon as observed by the pilot. The diameter of the instrument is about four inches. When used in blind flying a turning indicator is also frequently carried.

With such equipment, then, an aeroplane can be piloted safely through clouds for any distance, depending only upon the comfort of following the indications of the instrument, and a flight of, say, 50 miles in cloud is easily accomplished. There still remain the limitations, however, that to find position some guide from the earth or sky is needed, and to land, visibility of the ground is essential. The first can readily be overcome by the aid of radio direction-finding apparatus; the second is, however, vastly more difficult of accomplishment, although experiment has already shown that an aeroplane may be landed blindly with the aid of special equipment. These problems are, of course, those of fog flying, and it is proposed to discuss the probable solutions. Before describing the method of and means for navigating and landing in fog, it is well, however, to reflect on the aspects of the problem apart from those of suitable equipment. It is safe to say that, provided a visible landing ground is available, no pilot skilled in the use of cloud-flying instruments has any difficulty in flying out of sight of the ground, since, apart from the unlikely event of colliding with another aircraft, he has no fear of meeting obstructions and can, with the aid of radio direction finding, be sure of maintaining his course and ascertaining his position. It is a vastly different matter, however, when he is called upon to descend to such an altitude that ground obstructions become likely and, in addition, he is unable to see any landmarks to guide him as to his whereabouts for alighting. These difficulties are accentuated since he is called upon to discard his normal methods of landing and rely solely upon the indications given by substantially novel and probably infrequently used devices, while travelling at a speed of, say, 80 miles per hour. The problem thus tends to assume a psychological aspect, and only by that confidence in his equipment attained by frequent use under good conditions of visibility can a pilot be expected to establish the state of mind necessary to enable him to make a purely instrumental landing. That such a state of mind can be achieved is beyond doubt, as a result of the experiments in America and in this country, but it would be unwise to assume that a pilot can be expected to make blind landings

without considerable experience under fair weather conditions. The successful experiments in fog landing carried out by Flight-Lieutenant G. S. Oddie at Farnborough in June, 1930, during which this officer took off and landed on five consecutive occasions in fog, were based upon such fair weather experience.

It is not possible yet to discuss fog flying and landing as a routine practice, since little has been done in this or any other country to convince pilots and passengers that such landings may be accomplished with safety. It is possible, however, to discuss the procedure adopted and the means employed which render such landings feasible. It is not worth while, in the space at our disposal, to refer to the many schemes proposed from time to time, for there is such a vast difference between schemes and practicality that only those schemes which have been developed to the point of trial are worthy of note at present.

The most elaborate attempt at fog landing known, is that carried out under the auspices of the Daniel Guggenheim Fund in America. This has been selected, after careful and comprehensive consideration had been given to all available methods. Briefly, it consists in the laying down of radio beacons capable of guiding the pilot to the landing ground, and indicating when he is sufficiently near to this ground to make his descent, and instrument equipment to enable him to fly blind and to ascertain his height above ground. It is interesting to note that two common assumptions were discounted by the Fund: first, that wind velocity was low during fog conditions; and second, that fogs frequently extend up to comparatively low altitudes only.

One important item of aircraft equipment, however, was not utilized by the Fund during its experiments, namely, the automatic pilot, which by its ability to fly the aircraft on a given course and at a given altitude would relieve the pilot sufficiently to enable him to concentrate on the special instruments for locating his position and height with respect to the landing ground. This was stated to be due to failure of such controls as were under review to maintain a steady course without the undesirable feature of over-controlling the aeroplane. This feature, however, is not present in certain automatic controls constructed in this country.

The special equipment carried on the Fund's aeroplanes comprised a visual indicator of the vibrating reed type to indicate when the aeroplane was pointing towards the radio beacon, operated of course by a receiving set; a gyroscopic instrument constructed by the Sperry Company of America for indicating the attitude of the aircraft in pitch and roll; a gyroscopic azimuth indicator, turning indicators, and an accurate altimeter of the barometric type, stated to be capable of indicating the height above the ground to within 10 feet after the ground pressure had been signalled from the ground. The principal

difficulties met when navigating by means of the radio beacon were:* (1) Proper volume control of the signal when approaching the beacon; (2) interference between radio bearing and marine beacons when flying near the coast; (3) interference with high power code stations; (4) static interference, which was less troublesome with the visual beacon than with an aural beacon; (5) avoiding hunting through the track of the beacon.

(To be concluded.)

* "Solving the Problem of Fog Flying." Daniel Guggenheim Fund for the Promotion of Aeronautics, Inc.

THE FUTURE OF ARMAMENT—AND ITS FUTURE USE

By Captain B. H. Liddell Hart.

Science and history are opposing factors in the problem of the future means and methods of war. Anyone who seeks to solve the problem thoughtfully, instead of sensationally, soon feels their contradictory pull upon his mind. In a dual sense it is a tug-of-war.

The progress of scientific discovery and invention is so fast, even though it does not keep pace with the imagination of those who exploit it in the popular press, that it would seem to be changing all traditional conceptions of warfare.

We have learnt, rightly, to distrust those who say of any new development that it is impossible, unworkable, or inapplicable. We have come, perhaps too readily in an historical sense, to assume that the vision of to-day will be the facts of to-morrow. Hence the ready ear accorded to those who paint lurid pictures of cities wiped out by new forms of explosives, of armies suffocated by new gases, of peoples annihilated by bacilli. The possibilities of atomic energy and radio waves transcend even these speculations. To-day is the hey-day of the death ray inventor and of the imaginative publicist who can make hay, financially, while the sun of science shines so splendidly as to dazzle the popular imagination.

Meantime the armed forces of the great powers browse placidly in their accustomed pastures, apparently as undisturbed by the march of science as by the headlong leaps of the "popular scientist." It is a curious contrast. The structure of most of these forces, far from being a development upon that of 1918, resembles that of the years before 1914, save for the appearance of sundry external accretions. It is reasonable that the armed forces should deal with facts and not with dreams; that their form and theory should not yet be affected by scientific visions yet unrealized. But it is irrational that they should have shown so little power of adaptation to the changed conditions already produced by weapons that have been tried in war and have been in continuous development since.

As early as the autumn of 1914 a sprinkling of machine guns converted the attacking lines of infantry into swathes of corpses or,

alternatively, chains of human moles. Only when the industrial resources of the nation had been converted to the manufacture of shells in vast quantity could the infantry emerge from their burrows. Only when the new gas and tank weapons had been extensively developed could they actually break through the opposing line, held essentially by machine guns. Yet to-day, twelve years after the war, the bulk of most armies still consists of infantry, and faith is still pinned to the idea of their attack, although machine guns are more numerous than ever in proportion to numbers of men, while the use of gas is banned and the use of tanks is on a puny experimental scale.

Again, it was in March, 1918, that aircraft squadrons attacked the enemy's marching columns and their transport with such effect as to be one of its main factors in paralysing the German onrush towards Amiens.

The use of aircraft was merely a diversion, compelled by the emergency, from their recognized subsidiary rôle of serving as the eyes of the armies or blinding the eyes of the enemy. But in the closing months of the war it was air attack, again revived, which dispersed the retreating columns of the Bulgars, Turks and Austrians, in turn, into fugitive mobs. Slender as this experience, because of belated trial, it sufficed to reveal a new truth. Troops who are constantly forced to halt, break their ranks and seek cover will never reach any strategic goal. And if deprived of food and ammunition they are reduced to helplessness. The greater the numbers the greater the encumbrance. The advent of air attack has given a new meaning and a new force to Marshal Saxe's acute verdict two centuries ago—that "multitudes serve only to perplex and embarrass." Yet in 1930 we still find most nations placing their trust in weight of numbers, while even those who abjure large conscript armies do so for political rather than military reasons, and maintain their own professional armies on the traditional pattern. As smaller replicas they may suffer less, but can hardly effect more.

As early as August, 1915, occurred the first sinking of a ship by a torpedo fired from a seaplane. It was a merchant ship, and the failure to repeat the feat was due, on the Allied side, to the subsequent absence of enemy merchant ships at sea. On the other side, imitation was debarred by the distance of allied sea routes from the Germans' seaplane bases; they relied throughout on submarines for commerce destruction. These brought Britain to the verge of starvation, although the total of submarines on active service never rose above 140, and although the campaign was conducted from the most unfavourable geographical situation. To-day the seaplane or flying boat is a greater potential threat to sea-borne commerce than ever was the U-boat; its range has so extended that the Mediterranean, for

example, has been reduced to a narrow channel wherein the flow of merchant shipping could be blocked as easily as of yore in the English Channel. If the fact that the first ship sunk from the air was a merchant ship has a prophetic significance, this does not exhaust its significance. Owing to the necessity of displacing a volume of water equal to its own weight, the under-water hull of any warship is virtually a gigantic egg-shell. The term is apt because it expresses the essential fragility of the steel skin—no thicker than a matchbox. While the use of an inner shell or hull sub-divided into multiple compartments minimizes the danger of actual sinking, it cannot prevent such damage as would suffice to lame the ship while at sea and force it subsequently to lay up in dock for repair. No precautions, moreover, can safeguard the propellers and rudder of a ship from the danger of an under-water explosion. One lame unit is a handicap to any fleet, affecting the whole; several units damaged simultaneously would strain the dockyard capacity of any nation. The implications are obscured by the popular and even professional delusion that only sinkings count. This is a fallacy akin to the idea of "killing" in land warfare. In reality, it is more fruitful to wound than to kill. While the dead man lies still, counting only one man less, the wounded man is a progressive drain upon his side. Comrades are often called upon to bandage him, sometimes even to accompany him back; stretcher-bearers and ambulance drivers to carry him back; doctors and orderlies to tend him in hospital. And on his passage thither the sight of him tends to spread depression among the beholders, acting on morale like the drops of cold water which imperceptibly wear away the stone. So at sea crippled ships have a cumulative effect in crippling the fleet, both directly and indirectly.

Paralysis, rather than destruction, is the true aim in war, and the more far-reaching in its effects. To ensure this paralysis even actual damage is not necessary; the fear of it will suffice, as the last war proved. Although the British Grand Fleet remained in "command" of the surface of the North Sea after Jutland in 1916, it was itself confined, like an old-time debtor in the Fleet Prison, by the fear of under-water attack. Debarred altogether from the southern half of the North Sea, it could not even put to sea from its far northern base without an escort of nearly a hundred destroyers. And when the danger of a German invasion of Denmark loomed up, the British Government was faced with the confession that "for naval reasons it would be almost impossible to support the Danes at all." If so complete a paralysis could be brought about by such a slow and half-blind antagonist as the submarine, it would seem to be far more certain to occur in future whenever a battle fleet is within flying range of any coastline or of any aircraft carrier afloat.

In face of these outstanding deductions from actual experience of war, these logical portents, it is astonishing to see no radical change in the structure of modern armies and navies. What is the explanation? We can find it in history, for history acts as a firm check on rational assumptions that the weapons and methods of another war will correspond with the state of science at the time of its outbreak.

It is a popular comment that every war is different from the last. Actually, a survey of the whole course of military history brings out, as a dominant fact, the remarkably gradual evolution of military methods, and the slight difference of technique between one war and the next. Rarely do we find that even the contemporary experience of one war has been applied to the structure and tactics of armies when the next war overtakes them, sweeping them up like driftwood in a flood. Still more rarely has anyone taken time by the forelock and ensured victory by anticipating the trend of warfare.

The utilization of new weapons in war has followed far behind the period at which they were technically possible or even produced. Even Napoleon, who wrought such great changes in military methods, was curiously indifferent to the opportunity of introducing new weapons, and his era of warfare notably unproductive, although it coincided with the neap tide of the Industrial Revolution. So also in the American Civil War, which produced the highest level of generalship that has been seen since, armament lagged well behind the pace of invention. Both North and South went to war with muzzle-loading muskets, and even in the last year of the conflict breech-loading magazine rifles had been belatedly adopted by only a small proportion of the troops, who thereby had a decisive influence, out of all proportion to their numbers, in the critical battles near Atlanta and at Franklin. It was the acute verdict of the Confederate, General Alexander, that "had the Federal infantry been armed from the first with even the breech-loaders available in 1861, the war would have been terminated within a year."

The evolution of methods is even slower, because any step forward is usually followed by a slip backward. In "All our Yesterdays," H. M. Tomlinson remarks, "The war the Generals always get ready for is the previous one." He is wrong. The war for which they prepare is the one before the last. If the French Army in 1914 had gone to war with the methods learnt in 1870 it would have fared much better, and the manhood of France would have suffered much less. The first post-war doctrine after 1870 was as practical as its last pre-war doctrine of 1914 was fantastic. Between the methods of 1918 and the French text-books issued immediately after 1870 one finds only a difference of degree. But the text-books of 1914 are far removed from 1918—as far as the Crimea.

The idea that every war has been different from the last is the delusion of those who know not history. The next war has normally begun where the last left off, with, perhaps, a slight modification, governed not by the actual development of weapons in the interval but by such fraction of that development as has been recognized and incorporated by the peace-time armies. The Generals, however, have usually begun where the last war begun. In consequence, they are discomfited. And public opinion complains that they have stood still while warfare has changed. It fails to realize that the Generals have moved—backwards.

The fallacy of imagining that each war is different from its predecessor can be seen by comparing 1914 with 1904. Nearly every disconcerting development which upset calculations in the World War was foreshadowed by the Russo-Japanese War—the paralysing power of machine guns, the hopelessness of frontal attacks, the consequent development of trenches and barbed wire, and, to counter them, of grenades and heavy guns. In the light of the Russo-Japanese War it did not require a seer to foretell that, with much larger armies in a smaller space, the entrenched fronts would soon stretch across the whole frontier and stagnation ensue. Twenty years before a Polish banker and amateur of war, M. Bloch, had foreseen it. And the only ground for surprise is that so few believed him. For even he was thirty years late in his discovery. Most of the officially unexpected experiences of the World War could have been deduced from a study of the American Civil War—its prototype. And even the ultimate factors which brought about the collapse of the Confederacy were repeated in the decline and fall of the Germanic alliance.

Hence speculation as to the nature of another war is not so vain as superficial cynics would suggest. Cynicism is justified—but at the certainty of conservatism rather than at the possibility of calculation. To predict the ultimate conditions and weapons of another war may be rash, but not so to gauge what they will be at the start. And this question is all that concerns any practical inquiry into the future of armament. Using historical experience as a springboard from which to take off, we arrive at the conclusion that it will be merely an improvement of existing types. The recent acceleration of mechanical progress is likely to correct the backward swing of the military pendulum, but can hardly do more. Science will still be held in check by history.

Hence we can rule out the adoption of "death-rays" and other revolutionary weapons—the pigeon-holes of the War Departments are the most effective of antidotes to any new poison. An anecdote may emphasize the point. After the last war the plans of a tank, designed in 1912 and more advanced than the actual machine of 1916, were

unearthed from the dusty recesses of the British War Office and found to bear this brief verdict of authority—"The man's mad." The possibilities of germ warfare may be discarded even more emphatically. Even if any government was capable of sanctioning a weapon so uncertain in its physical and so certain in its moral recoil—Germany's experience has shown the boomerang effect of shocking the world's conscience—the soldiers may be trusted to prevent any risk of their being superseded by the bacteriologist.

Gas is in a different category. Now that its novelty is past it would be difficult to kindle any crusading enthusiasm against its use, for it is manifestly irrational to argue that the mutilations of high explosive are more humane than gas. Hence we may anticipate that prohibitions will be evaded. But this is not an endorsement of the sensational predictions that armies will be stricken as suddenly as the Assyrians in Biblical myth, that cities will fall into the sleep of death under the discharge of some unknown gas. Chemists tell us that the discovery of entirely new gases is unlikely, and that future progress is likely to be along the line of producing variants of the main types of chemical compound already known. Of these the acute lung irritants, such as chlorine and phosgene—the essentially lethal gases—proved less effective than, and were gradually superseded by, the sensory irritant smokes, such as diphenyl chlorarsine, and vesicants, such as dichlorethyl sulphide, commonly known as mustard gas. The significance of this is that it not only had a more extensive and persistent effect, but instead of killing put men out of action for a time: a time long enough for the issue of a battle, or even a war, to be decided before they were fit again. The possibility of contaminating large areas with this blistering substance, and the fact that its effect does not develop until some hours after contact, make it as potent morally as physically, for no man, having passed through a contaminated area, knows whether he has not accidentally got a smear on his hands or clothing which will presently give rise to the dreaded blisters. Uneasiness is all the greater, because one affected man may "infect" dozens of others before it is even known that he is affected. Truly, mustard gas is a modern chemical form of measles.

If it is too much to expect that the warning will be heeded, the possible use of mustard gas in another war is another hindrance to the use of armies composed of infantry, for to be secure against it an infantryman must wear not a respirator but a complete diver's suit, in which movement would be impossible. And if a man cannot move he cannot fight, except sitting in a trench. Mechanization is the only solution. For to infantry armies, a stretch of country sprayed with mustard gas will be as complete a barrier as barbed wire has been to the infantry unit. Only in tanks and similar protected vehicles will

man be able to manœuvre freely in a theatre of war where gas is employed.

This reflection leads us to the definite question, what will be the future trend of land armaments? The army which has gone furthest to answer it has been the British. The other armies, save the German, have marked time at the point where they left off the war, or have already slipped back a year or two. The Germany Army, converted unwillingly into a small professional army, has as rapidly acquired a new faith, that of the superiority of such an army, highly trained and mobile, over the unwieldy masses of a conscript army. In its standard of training the new German Army lives up to this idea, but by the terms of the Peace Treaty it is forbidden the tanks and other machines which are the natural complement to this ideal. The British Army, after beginning its post-war career with a cry of "Back to 1914," has actually advanced some way along the road signposted in 1918. It was the first to be equipped with high-speed tanks, the first to use tanks independently of infantry, the first to adopt six-wheeled cross-country transport; it formed the first completely mechanized force, and issued the first official manual of mechanized warfare. Even so, its practice has not kept pace with its theory. Its mechanized units, if modern in idea, are undeveloped in figure, and it has done nothing yet to rid itself of its adipose tissue of infantry. Its leaders put off the fateful decision by continuing experiments which have already yielded all the proof that is possible.

Yet the British Army has at least more excuse than others for obsolescence. Whilst the majority of other armies are trained essentially for war, the British Army is primarily a force for policing the Empire. And the Briton abroad, more responsive to traditional instinct than to reason, still finds more comfort in the visible presence of khaki-clad guards scattered about the country than in the potential appearance of armour-clad machines that can be switched swiftly to the scene of an outbreak. It is this demand for infantry as policemen which at present hinders the British Army from being modernized in the way its leaders now realize is essential for any future war.

This modernization is likely to take two forms, which are to some extent successive stages. The first is motorization; the second true mechanization—the use of armoured fighting vehicles instead of unprotected men fighting on foot or horseback. Motorization has already gone far, accelerated by the advent of six-wheelers and other types of cross-country motor vehicle which can move off as well as on the road. If these have to be quitted in battle they at least quicken the movement of forces to the battlefields and in strategic manœuvre. Although, with characteristic Fetishism, infantry are still trained to march on their feet, laden like pack animals, military authorities now recognize that

the day of such marching is past. In the British Army horses have been replaced by six-wheelers in the transport service, and for any emergency move these are utilized to carry troops. In the recent disturbances in Palestine the whole infantry garrison was hurriedly motorized with hired motor vehicles. Again, the German authorities are believed to have arranged for the complete motorization of their army, in case of war, from Government, municipal and commercial sources.

The future of "mechanization" is divided into two questions: that of the type of machine and that of organization. After the war most armies, under French influence, persevered with the heavily-armoured type of tank which, being sluggish, was intended merely as a direct aid to the infantry in attack. The British, however, developed a few fast type, lightly armoured and capable of a speed of about twenty miles an hour. The fact that their high speed was wasted, and their risk excessively increased, by tying them to the pace of the infantry, encouraged the idea of using them independently in wide outflanking manœuvres. This, in turn, led to the formation of a separate mechanized force of armoured fighting vehicles, a formation which fulfilled the conception of the prophets of mechanized warfare. Even though the force was imperfect in composition, it was certainly a unique event in military evolution that any military pioneers should see their prescription accepted within so short an interval of time.

In the last year or two, the diverging lines of French and British tank design have shown some sign of converging anew, the French giving increased speed both to their small tanks and to their super-heavy 70-ton tanks, while the British have added somewhat thicker armour, as well as a fresh increase of speed in the 30 and 16-ton tanks which have followed the original fast 10-ton tank, at present our standard machine.

The French 70-ton tank, which carries armour no less than fifty-five millimetres thick, naturally suggests the idea of future land dreadnoughts. But such speculations fail to take account of the difficulties imposed by rivers, railways and other obstacles. There are few bridges which could bear so heavy a machine without collapsing. For a specialized purpose, such as that of breaking through a strongly-entrenched line, this moving fortress might have value. For general utility, I doubt whether such large machines have a future. The bigger the machine the bigger the target, and on land the gun has far greater advantages in its competition with armour than at sea. It would not be easy to produce a tank with armour thick enough to resist a direct hit from modern field artillery, whilst the larger such machines become the more exposed they are to air-bombing. In any case, the high cost of these super-heavy tanks makes their development impossible, save experimentally, in peace time.

A more promising line of tank development, and, in my opinion, the trend of the future, lies in the direction of the miniature tank, built mainly from commercial motor parts, so that cheapness in peace and quantity production in case of war can be ensured. This line was initiated in England with the experimental "one-man tanks" of 1925, invented by Martel and Carden. Since then much progress has been made, and although they now have a crew of two they are still so small and low—lower than a man's height—as to be almost invisible targets, whilst their improved performance is obtained at a cost which, according to type, varies between that of a Buick and a Rolls-Royce touring car. In mass production it would, of course, be reduced. Now fitted with a rubber-jointed track, which needs no lubrication and has practically no wear, these light tanks have made journeys at an average speed of nearly thirty miles an hour, and can attain maximum speeds fifty per cent. higher. Within a decade one can foresee the advent of light tanks capable of sixty miles an hour. In its cheaper form this machine is already being used in the British Army as an armoured machine-gun carrier to replace not only the old horse-drawn limber but the extra men who were required to carry ammunition for the gun.

America has also entered the fast tank field with the multiple-wheeled Christie, convertible to tracks and capable of seventy miles an hour on wheels and forty on tracks. As a substitute for existing armoured cars, it has certainly good scope, but as an "in-fighting" tank the comparatively large target it offers is a drawback, and it would seem to be rather a basis for further experiment than itself to be the tank type of the future. To tank experiment, Italy has also made its contribution with the unique Pavesi machine, which has the appearance of two ancient war chariots coupled together, two pairs of large wheels, with a remarkable degree of articulation, replacing tracks as a means of enabling it to cross rough ground.

There is, indeed, a plethora of new types of machine, some already proved and some still experimental, but, as a whole, so advanced as to establish the fact that mechanized troops will be able to move as readily across country and over the battlefield as infantry or cavalry units could in the past, and at a much higher speed, while enjoying the protection of armour. Mechanical feet have shown their general superiority over human and animal feet. And they enable the fighting man not only to use more powerful and heavier weapons but to fire while in movement.

The greater question of the future is how the transition will be made, and the structure of armies be adapted to the new form. Here the factor of expense reinforces the conservatism of the soldier in imposing a brake upon change. The army which first had the moral

courage to scrap most of its old-style units and replace them by a small number of mobile armoured units would at once enjoy an immense advantage over all others. The armies of the world would be thrown into the melting-pot, and from this might emerge not only a general new pattern but a real opportunity for an agreement upon the reduction of land armaments. The soldiers perhaps suspect this, and hence are the more dubious of change. But they are also restrained by lack of an outlook such as the modern industrialist possesses. They are willing to add the new machines to their existing forces if they had the money to do so, but are unwilling to scrap any of the old instruments, whereby alone they could obtain the money. The soldier is the Micawber of the modern world. He is always hoping for something to turn up, for some miracle of money from heaven which will rescue him from his dilemma, and allow him to buy a new outfit without selling the old.

Thus, as I see it, armies would remain as they are, growing ever more threadbare of value, with tanks a mere trimming—so long as tanks remain costly. The best chance of change lies with the development of the cheap baby tank such as the Carden. And the most likely way of change, not initially in their use as a separate arm, but in their adoption as the machine-gun carrier of the infantry. Last year, in several British infantry battalions, they replaced the old horsed limbers. The result was a revolution in machine-gun tactics and in the outlook of the infantry. In these carriers, as difficult to see as to hit, the machine guns could be brought up far quicker, could be switched from point to point, and could fire from positions far closer to the enemy, being so small and low that they could hide behind any bush or patch of gorse. But they did not merely cover the infantry attack with close-range fire. Often they would race forward to seize a hill or other point of advantage while the men on foot were still trudging laboriously towards it. Thus they became tanks, and their infantry crews, quite unconsciously, yet gleefully, became tankmen. Moreover, instead of six men being needed to serve and feed the gun, only two, a firer and a driver, were needed. The significance of this fact is that if these superfluous men had been discharged, the saving of their cost to the country in a single year would have more than paid the capital cost and upkeep of the little armoured carrier.

When each battalion is equipped with a score of these machines, soldiers will begin to ask whether eight hundred slow-moving and non-bullet proof riflemen are necessary as well. The latter will gradually be reduced both because they are redundant and to allow an increase of machines. The riflemen who remain will become lightly equipped skirmishers, armed probably with self-loading rifles—another dream now brought near to fruition—and carried on the march in

motor vehicles. The new battalion will require only a half, or even a third, of the present man power, while possessing much greater fire power. Then the natural sequence is that part of these modernized infantry battalions will be converted into pure mechanized units equipped with the superior quality light tanks. So also will the cavalry regiments, which already have tried and seem to relish the use of the armoured carriers for their machine guns.

Thus the army, as a whole now strategically mobile, will re-group itself into two fighting parts with separate tactical functions: one a close-fighting part, composed of semi-mechanized infantry, and the other a mobile fighting part, composed entirely of armoured fighting vehicles. The close-fighting units would be employed to clear hilly and wooded country, to gain river-crossings, to evict the enemy from villages or trench systems, to occupy strategic points, and to act as general handymen. The mobile fighting units would manœuvre widely to turn the enemy's flanks and attack his lines of supply. If they encounter an enemy in a well-prepared position bristling with anti-tank guns, their tactics will probably be akin to those of the Mongols, harassing the inert foe by fire while they cut off his supplies of food and ammunition until he is driven either to surrender or to expose himself in an attempt to get away. When acting in direct combination, the close-fighting part of an army would be used to pin and paralyse the opponent while the mobile fighting part would carry out a decisive manœuvre against his rear.

As for the artillery, expert opinion is already inclining to the view that the day of and need for the existing field gun is past. Even drawn by a motor tractor it cannot keep up with the movements of a mechanized force or with the kaleidoscopic changes of a mobile action. To do this it must be mounted in a tank. But for such open fighting the present 18-pounder is unnecessarily heavy; a 3-pounder or, at most, 6-pounder gun, such as a tank already carries, may amply suffice. And against a well-entrenched position an 18-pound shell is not heavy enough for effect, as experience showed in the last war. Hence it seems likely that the artillery of the future will comprise two main classes: first, light guns mounted in tanks and absorbed into their organization; second, heavy tractor-drawn artillery, which, like the siege engines of antiquity, will be brought up only when the enemy is found in a fortified position.

Nor is this the only parallel with antiquity, for in nature and in function the close-fighting and mobile-fighting parts of the army would correspond to the infantry and cavalry arms of the armies of the later Roman Empire. And it is probable that history would again repeat itself in the gradual absorption of the first by the second until, as in the age of Belisarius and Narses, the "infantry" became a mere

auxiliary for military scavenging and the custodianship of what had been conquered by the " cavalry," who, in the main campaign, would merely dismount part of their men to act on foot when necessary.

To estimate the duration of this change of armies to a mechanized form is impossible. But one prediction is safe : that the longer it takes the more subsidiary will become the rôle of the army itself. The reason is that this transition is a replica within the army of a greater one in process outside, and the greater will exercise an increasing influence on the less. For the air appears destined to be to armies what mechanized forces are to infantry.

Military organization at its several peaks in history has been based on the combination of a defensive pivot and mobile offensive wings. The first afforded the stability from which the decisive mobility of the second could be developed most effectively and securely. Thus did Alexander, Hannibal, Scipio, Marlborough and Frederick achieve their triumphs. The fact that the pivot was stable did not imply that it lacked offensive power or mobility—in fact, Alexander's phalanx, Scipio's legion, and Frederick's Prussian foot possessed both—but only that it possessed these qualities in lower degree than the cavalry which struck the decisive blow.

To-day the respective qualities of armies and air forces suggest a striking parallel. Even the word " wings " emphasizes it. Armies have immense defensive stability by virtue of the machine gun, but have lost both their mobility and offensive power. Mechanization will restore these qualities in considerable degree, will raise armies that adopt it to the level of the Macedonian phalanx and the Roman Legion. If they do not adopt it they will be relegated, like the infantry of the Middle Ages, to the subordinate and passive rôle of mere garrison troops.

The wider rôle of mobility and offensive power lies in the air. And the air force appears to be cast for the decisive rôle, as the heirs of Alexander's " Companion " cavalry. Thus, as of old the forces of a nation for war on land were thought of in terms of infantry and cavalry, though each had its several sub-divisions, so in the future we need to think of the army and the air force as the two main components of military power.

In one country at least this conception has already taken hold. Among Italy's present leaders are acute minds who, in reviving the Roman tradition, have remembered the fact that Roman statesmen understood war as well as politics. In discussion with them I have felt that they now regard the army as the holding force and the air as the striking force, and that in case of war the former would act as a secure springboard, gradually pushed forward, from which the latter can jump—over the enemy's natural and artificial defences, the mountains and fortified lines.

In Italy's case, geography is a spur to this new theory of war. The mountain barriers astride most of her possible theatres of war would be a hindrance to her army in gaining a decision, and would also limit her scope for the use of mechanized forces. With other armies, likely to operate in more open theatres, there would be greater scope for the offensive so long as they were mechanized. An unmechanized army will, as in the immediate past, be incapable of advancing in face of machine guns, and will become a target for hostile air attack. The larger it is the easier it will be to starve by air bombardment of its lines and depots of supply. But mechanized forces, advancing by rapid bounds, may themselves find a target in the enemy's aerodromes. By attack on these they may cripple the enemy's air offensive, or at least force it to be carried on from bases further back, thus diminishing its effect. They may, further, gain control of the enemy's aircraft or munition factories, or of the sources of raw materials upon which the maintenance of both his military effort and national life depend. For these economic resources rather than the armed forces will be the real point of aim in another war, and the latter only an obstacle to be overcome if it cannot be evaded on the way to the economic goal. This reflection does not imply that civil resources, still less the terrorization of the people, will be the deliberate military aim at the outset of another war. Fear of neutral opinion is likely to be too strong a deterrent, and will be reinforced by military habit. But it will be no longer possible to draw a clear distinction between military and civil objectives. This distinction in the past has rested far less on a legal definition than on the simple physical fact that the enemy's army was in the way, and afforded a shield to the country behind. Now air forces can jump off this shield and mechanized forces can slip round it.

Munition centres are justifiable military targets, and they are usually in industrial areas. Railways are used to carry troops, and so they also are a fair target. It would be absurd to contend that troops are only open to attack when in a geographical zone popularly called "the front." They train and assemble in camps at home, travel by road and railway, passing through cities, and although they were usually immune before aircraft were invented they cannot claim immunity. Thus the infliction of military and civil damage, material and moral, will coincide. Again, ports are justifiable targets because warships and troops sail from them, and it will be a fortunate coincidence for the enemy that food supplies also enter by them. Thereby, with more assurance and less risk of odium, the flow of seaborne commerce may be cut off at its source instead of in transit. With an island state the screw of starvation could easily be put on the will of the people to induce surrender.

In this future warfare, economic in aim, the air will be the dominant partner. If the sea spaces are wide, navies will play their traditional part, although increasingly "aërated." Armies, in so far as they are mechanized, may co-operate profitably, otherwise they will be a mere auxiliary or an expensive encumbrance. Surveying the course of history, one cannot be hopeful that they will adapt themselves to the changed conditions of warfare in time, for armies have to overcome their own inertia of conservatism, whereas the air force has begun its career with the immense psychological advantage that it is a mechanized force.

AIR PHOTOGRAPHY

By Wing-Commander F. C. V. Laws, O.B.E., R.A.F.

II.—POST-WAR DEVELOPMENTS.

In writing this chapter on the post-war developments of air photography, I have attempted to include the results of experiments and everything of real interest, omitting the intermediate stages and failures. In my previous article will be found sufficient material to illustrate to what extent this subject was understood at the end of the war, and in this it will be seen that it was upon the experience gained during the war that our future programme of development was based.

Arising out of the war, two distinct uses for air photography emerged, both of vital importance to the conduct of military operations and both providing problems requiring separate solutions. These two uses may be classified as under:—

(*a*) Tactical Photography for Intelligence and Reconnaissance.
(*b*) Photography for Air Survey.

The solution to (*a*) lies in the increased efficiency of the photographic equipment, including means for the rapid production of negatives and prints. Photographs taken for this purpose are of increasing value in studying ground to be fought over, and will often be used in war to amplify the map (if one exists) and to discover hostile battery positions, entrenchments and other tactical features. If this is the accepted use, and the situation examined in relation to the modern principles governing Army training, it is abundantly clear that greater speed in the production of photographs is necessary.

The progress made since 1919 has been chiefly in the direction of improved cameras. In this respect it is safe to assert that the technician was in advance of the tactician. Most of the photographic apparatus I shall describe was produced during the lull in the demands for air photographs which occurred immediately after the war. Interest is, however, now returning, and increased demands are forthcoming from the Army. It is most desirable that such demands should be continued if progress on the technical side is to be maintained.

Other items of photographic equipment, such as sights, camera mountings, printing apparatus and developing tanks, etc., etc., must be considered in conjunction with the production of a new camera —it was the absence of mechanical means for the development of film

which retarded the production of a film camera during the war. These items will all be dealt with after I have described the camera, which represents the biggest advance.

The detailed requirements for an ideal air camera were stated as far back as 1923 in a contribution by the writer to a book entitled "Photography as a Scientific Implement." It is now possible to relate to what extent this ideal has been achieved.

Briefly, the requirements were: a camera fully automatic in operation, electrically controlled, using film as the sensitive medium and equipped to take interchangeable lens holders. Upon each negative should be recorded automatically sufficient data to identify each photograph and its scale, etc., after printing.

The type F.8 camera goes far to attain this ideal. (Fig. 1, F.8 camera; Fig. 2, camera parts.) It is built up on a unit system, any one unit from any camera being immediately interchangeable without adjustment with the corresponding unit of any other camera. This has great advantages, and by its use the problem of maintenance is greatly simplified. The camera is composed of six main units, viz.:

(*a*) Camera body.
(*b*) Lens cone.
(*c*) Focal plane shutter.
(*d*) Film magazine.
(*e*) Gear box.
(*f*) Instrument box.

These units are rigidly connected together, and form the complete camera. There are also a set of auxiliary units, flexibly connected to the main instrument. These are:

(*g*) Accumulator.
(*h*) Electric motor.
(*i*) Electric control unit.
(*j*) Pilot's lamp.
(*k*) Flexible drive.
(*l*) Electric leads.
(*m*) Fuse box.

When using this camera, the turning of a switch sets in train the whole cycle of operations necessary to produce a series of exposures. Exposures are made automatically at any desired interval of time, and the number of exposures made is recorded on both the electric control unit and on the film magazine.

The pilot receives a 5-second warning of the imminence of each exposure by means of his indicator lamp.

In addition to the objective, *i.e.*, the ground covered on each negative, an image is registered showing the time, aneroid reading, serial

number of the exposure, and the record of a two-way spirit level. A blank tablet is also provided, on which the usual data, *i.e.*, squadron number, focal length of lens, and date, can be written.

Whilst the camera is being reset ready for the next exposure, the operator is warned of this fact by a SET indicator on the electrical control unit. During this operation a striped drum, geared to the film spool in the magazine, revolves. This stops when the supply of film is exhausted. By this device the operator can tell at a glance whether the magazine is functioning correctly.

A press-button switch on the electric control unit enables single exposures to be made either in addition to or instead of the series made automatically at set intervals.

As an alternative method for driving the camera another unit, the windmill, may be substituted without loss of efficiency. If, however, electric power is for any reason not available for the release, the mechanical control unit can be used to control the exposures. The windmill takes the place entirely of the electric motor, and the only sacrifices in efficiency made by its adoption are:

(1) Exposures must be made by hand, using the exposure lever on the mechanical control unit.
(2) The interval between the exposures must be timed by the operator.
(3) The pilot is not warned when exposures are to be made.

In the absence of both motor and windmill five turns of the winding handle of the camera gear box suffice to change the film and set the shutter, and exposures can then be made with the mechanical control unit. A counter is provided on the unit to register the number of exposures.

From the foregoing description it will be seen that four alternative means are provided for manipulating the camera, either of which can be used separately or in conjunction with the others. They are:

(1) Fully automatic operation, with windmill drive and electric control.
(2) Fully automatic operation, with motor drive and electric control.
(3) Semi-automatic operation, with either motor or windmill drive and hand release.
(4) Hand operation and bowden release.

The reliability of this camera is of a much higher order than any previous model, and due to its unit construction presents no difficulty whatsoever for maintenance in the field.

An analysis of what has been accomplished by the introduction of

this apparatus reveals how great an advance has been made. The most drastic change effected is the introduction of films instead of plates. The advantages of this cannot be over-estimated (Fig. 3). They may best be judged from the undermentioned comparisons, taking a given area to be photographed using the F.8 type camera with its size 7 in. by 7 in. negative and 7-inch lens, and the type P.7 with its 5 in. by 4 in. size plates and 6-inch lens:—

Comparative weights of the two cameras equipped ready to cover an area of 20 miles by 20 miles at a scale of 1/24,000 are:—
F.8.—Camera, 52 lb.; film and magazine, 41 lb.; total, 93 lb.
P.7.—Camera, 20 lb. 8 oz.; plates and magazine, 102 lb.; total, 122 lb. 8 oz.

Number of magazines necessary in the air:—
F.8.—3. P.7.—28.

Number of exposures required to cover the area:—
F.8. Film.—209. P.7 Plates.—495.

Flying time taken to make the exposures, exposing at 14,000 feet with 7-inch F.8 and at 12,000 feet with 6-inch P.7:—
F.8.—2 hr. 34 min. P.7.—3 hr. 30 min.

Time taken to develop and dry:—
F.8.—2 hr. 5 min. (three men employed). P.7.—5 hours (four men employed).

Time taken to title the negatives:—
Actual time too uncertain to quote, but will work out in the ratio of 2:1 in favour of the F.8 film.

Time taken to make six prints from each negative:—
F.8 Film.—5 hours. P.7 Plates.—7 hours.

The above comparisons constitute the main advantages gained in photographic operations. There are also tactical gains, *e.g.*, complete freedom of the crew of the aircraft whilst making the exposures. Once the circuit is closed by switching on the camera the crew are free to maintain their course over their objective and to protect themselves against hostile attack.

Changing magazines in the past was always a difficult task. This has now been reduced to a minimum. Whereas on the plate cameras the complete magazines were changed for each eighteen exposures, they are now changed only after each hundred exposures.

The installation of the camera has also been considerably simplified. The introduction of an electrical control enables the camera to be installed in almost any position on the aircraft, irrespective of its position in relation to the crew.

These many advantages have not been gained without certain disadvantages. There is, of course, a considerable difference in the cost of the camera by comparison with its predecessor, the new camera

being much more costly to produce. There is also the unsatisfactory keeping qualities of the film.

The emulsion used in coating the film is of the panchromatic type and is precisely the same as that used on the plates, but its keeping quality on a film base bears no comparison with the glass plate base. I do not, however, take a very serious view of this. Whilst the films are fresh the results are a great improvement on anything we have had in the past, but there is unfortunately this rapid falling off in speed after a few months' keeping, resulting in under-exposure and loss of detail.

The film industry of this country has recently been reorganized and has made great strides, which have enabled it to secure its share of the world's markets for roll film. So much so that I believe the factories have now reached their full capacity of output.

As the Royal Air Force are practically the only users of panchromatic roll film, and the quantities they require are relatively so small, it can readily be understood that the manufacturers cannot afford to devote much time to research. They are, however, doing their utmost to compete with the situation and have made considerable improvements during the past three years.

There is one other advantage gained by the use of this type of camera, which I am presenting at this stage because of its primary importance, *i.e.*, the size of the negative. In my previous article on war-time development I emphasized the handicap of a small-size negative and also drew attention to the necessity for bearing this in mind for future designs. Although the F.8 camera does not produce a negative of 18 by 24 cms., which was the standard size at the end of the war, it does produce one covering an area of approximately two and a half times that of the 5 in. by 4 in. There were sound reasons for adopting the size of 7 in. by 7 in., one being to provide a portion of the 24-cms. (9-inch) length of the film for automatic recording. Another is in connection with its application to air survey.

For this purpose it is desirable to use a lens covering the widest possible angle, and, as the covering power of a lens is measured by the diameter of a circle, as is also the illumination, the largest possible square placed within the circle produces the most suitable size for the negative.

The following example illustrates the area embraced by the 7 in. by 7 in. negative, using an F.7-inch lens, and 5 in. by 5 in. negative using an F.5-inch producing the same scale.

At an altitude of 12,000 feet they both cover 12,000 ft. by 12,000 ft. Therefore, for each inch of negative on the 7 in. by 7 in. size there are 571 yards of ground covered. If this is sub-divided, say, into sixteenths, it produces approximately 36 yards of ground per 1/16th

of an inch, whereas using the 5 in. by 5 in. there are 800 yards per inch and 50 yards per 1/16th of an inch. A reference to war-time photographs will show how much of military importance can be included in an area of 2,500 square yards. The necessity for the larger size negative is obvious.

This factor must at all times be considered in relation to the poor negatives which must inevitably result from adverse weather conditions and other war-time difficulties.

In the detailed description of the camera I have referred to the automatic titling of the negatives. In order to emphasize the importance of this feature more details may be written with advantage. During the late war the bottle-neck of photographic production was the B.I.O.'s (now I.L.O.) office, and still is the I.L.O.'s office. The most experienced photographer or draughtsman engaged in titling negatives cannot complete a glass negative and place it in its envelope in less than one minute. Therefore, with 500 negatives approximately eight man hours would be absorbed. In the type of warfare for which the Army is now being trained a loss of this time would be of considerable importance. If the Royal Air Force were called upon to take photographs of a Corps front with the old-type plate camera and deliver the requisite number of prints at Corps Headquarters, the time taken would be approximately sixteen hours. Using the type F.8, there would be a saving of at least five hours. This advantage in time is gained almost entirely by the automatic titling already described.

Negative Development.

The principles governing the production of a negative in air photography are the same as for the many other branches. It is only the conditions under which these principles are employed that vary.

Negative development when using a plate camera presents practically no difficulties. Development may be carried out either in dishes or tanks. The latter are usually adopted where time and temperature factors are used. In air photography the use of panchromatic plates renders tank development most desirable.

The introduction of roll films produced a problem quite unlike that of handling plates. It necessitated mechanical means for manipulating long lengths of sensitive film in development, fixing, washing, etc. To those who have attempted to develop film of the size normally used in hand cameras the problem of handling a film 65 feet long will be appreciated. Even when using mechanical means many difficulties are experienced, but generally speaking these have been surmounted.

The first method employed involved the use of a rotor (Fig. 4). This, complete with film, was immersed in a large tank containing 22 gallons of developer.

This scheme was quite effective, but was clumsy and extremely expensive and has now been superseded by a series of tanks containing two large rollers (Fig. 5). These have been used with unqualified success. The film is wound from its spool on to the rollers, which are so arranged that in winding it from one roller to the other the developing solution flows evenly over the whole surface of the film.

This new tank uses only two gallons of developer for each roll of film, thereby effecting an economy of 20 gallons of solution per roll of film. Also, by reason of this reduced capacity, the problem of obtaining adequate supplies of water and of maintaining the correct temperature of solutions in tropical countries is largely solved.

Drying.

Experience shows that drying glass negatives is a simple operation. The plates are immersed in methylated spirits and rapidly dried, but for drying film negatives spirit cannot be used. Other means must be provided, the simplest so far being the common drying drum as used in cinema film producing factories. A more satisfactory solution is still outstanding, and before finality is reached some form of apparatus in which the film may be placed and dried within a specified time with absolute certainty must be designed. For the present, drying is very largely controlled by atmospheric conditions, consequently the time required is problematical.

In modern factories, cinema film is passed through a series of long ebonite tubes. In these the films are developed, fixed, washed, cleaned and dried. Something on these lines may ultimately be evolved for air photography.

The Production of Prints.

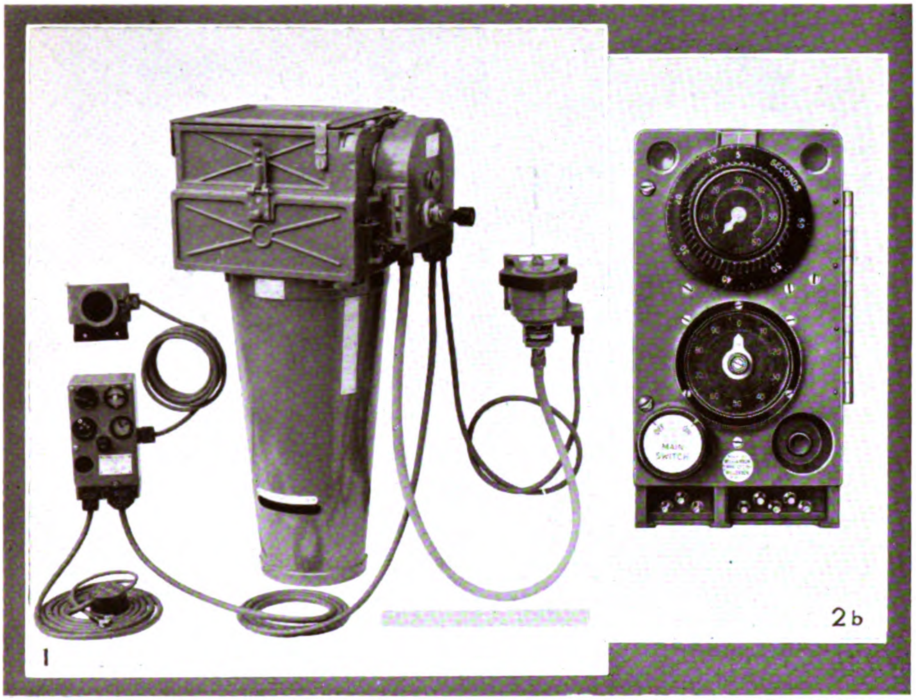
Printing usually falls under one of two common types known as contact prints or enlargements.

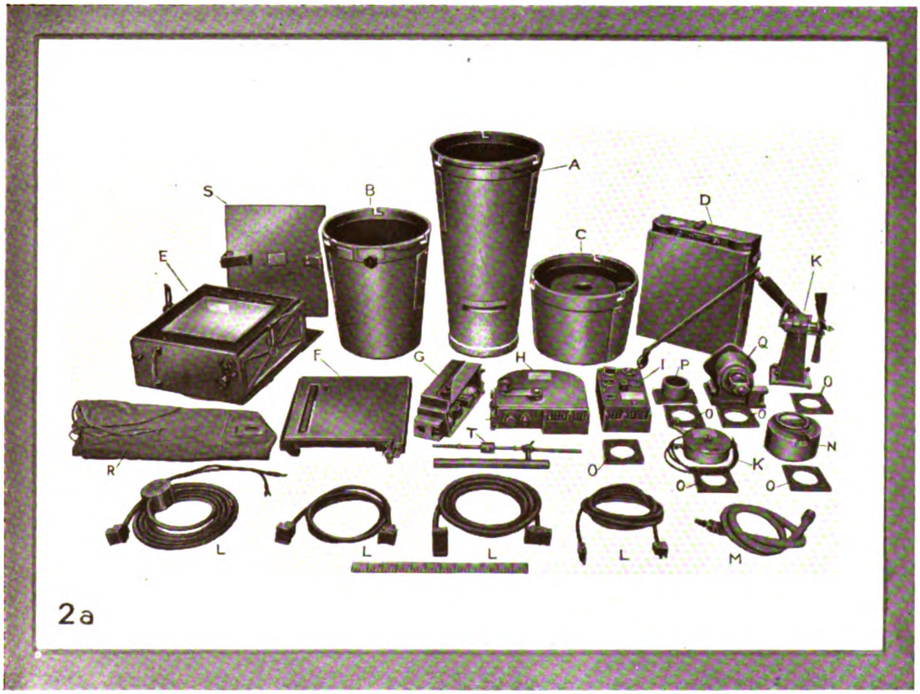
The second category in air photography would be better described as printing by projection. Prints so made are not infrequently reductions and occasionally to the same scale as the negative, but probably corrected during the process for tilt.

A common fault in printing with the types of enlargers with which we were familiar during the war was the warping of the wooden structure of the lantern. This caused considerable stiffness in the focussing and, coupled with the fatigue of the photographers, often resulted in the dispatch of large batches of unsharp prints from negatives of critical definition.

Modern equipment is designed to overcome this—firstly by its all-metal construction and secondly by incorporating an automatic focussing device. (Fig. 6.)

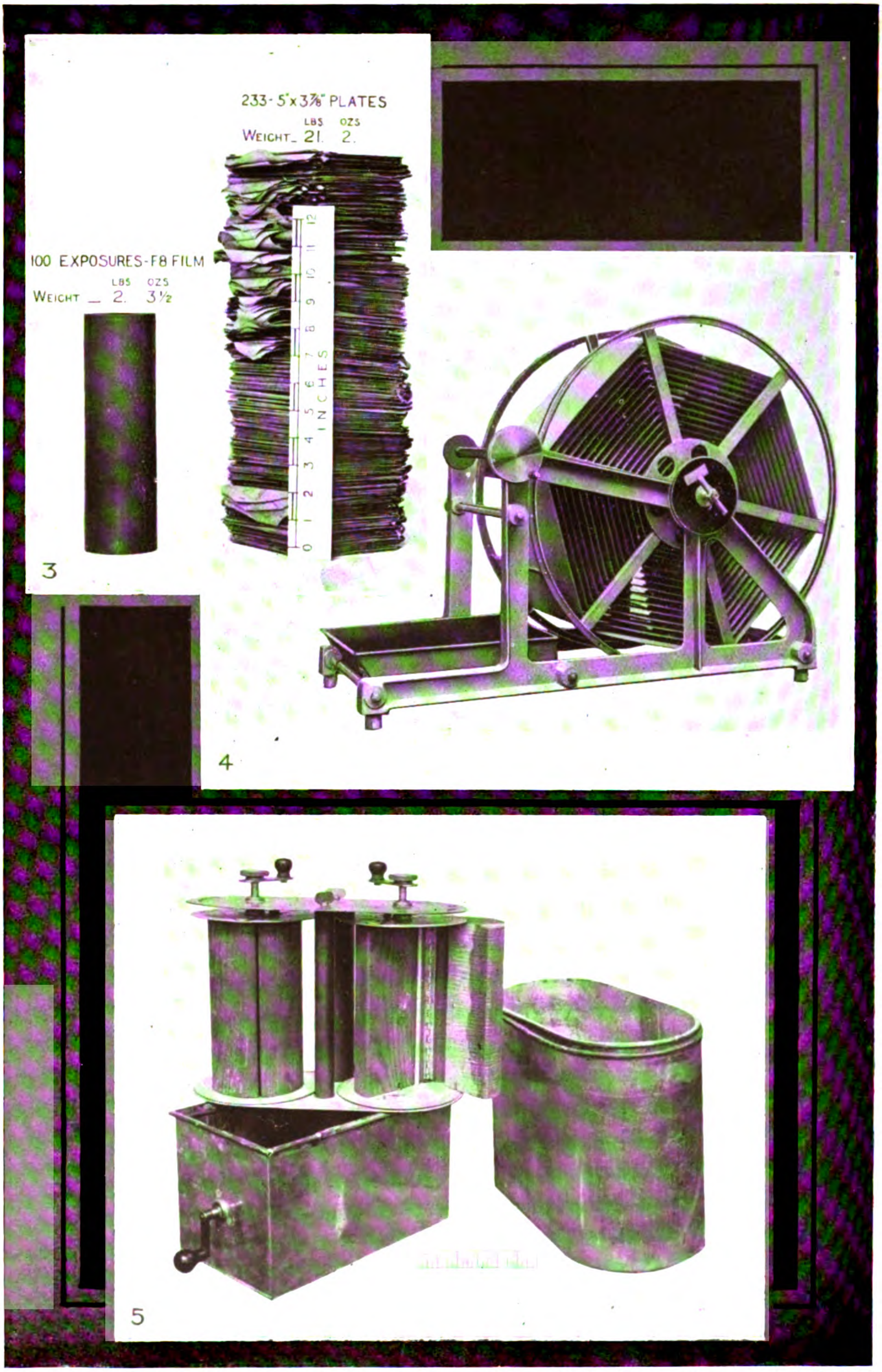
This type is capable of being used for F.8 film negatives or glass





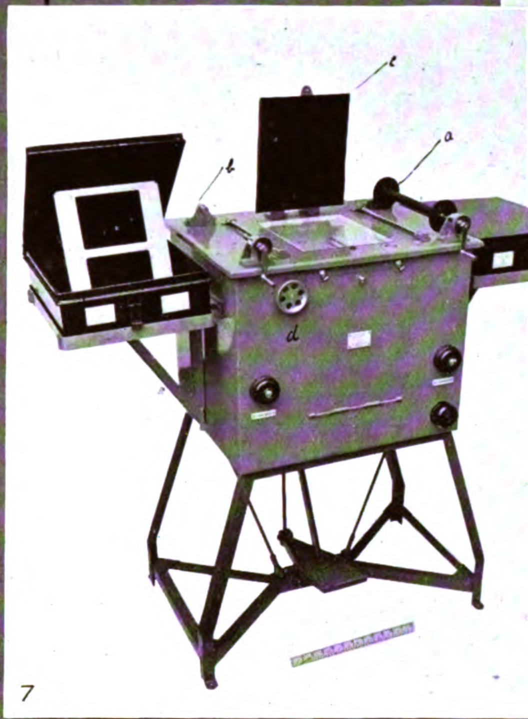
[Photo: Williamson Mfg. Co., Ltd.

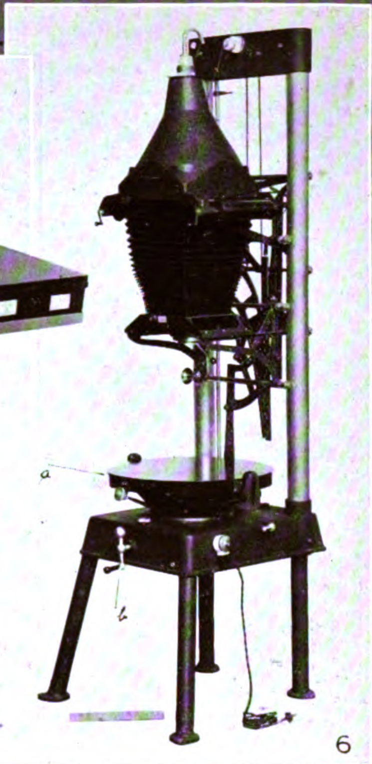
1 THE F.8 CAMERA. 2a and 2b. F.8 Camera Parts.

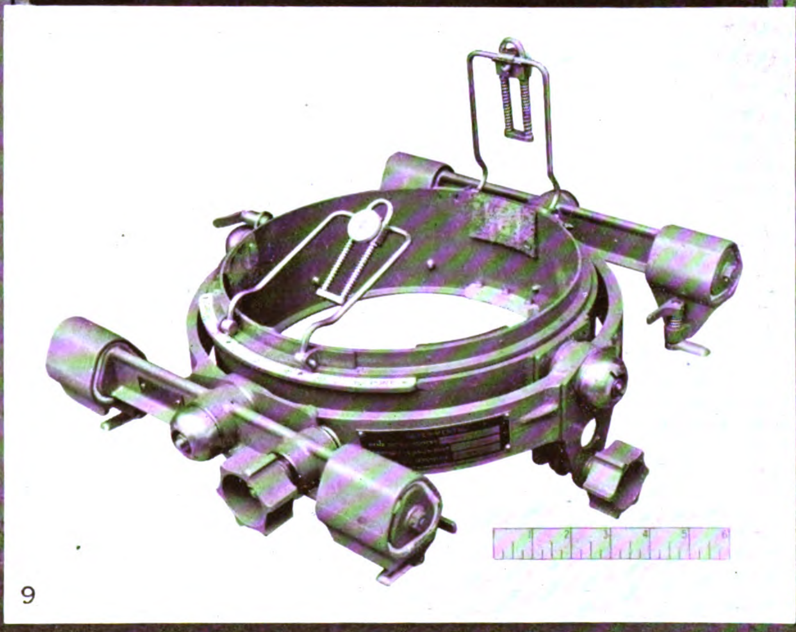


[4, *Williamson Mfg. Co., Ltd.* 5, *R.A.F. Official: Crown Copyright Reserved.*

3. ILLUSTRATING THE ADVANTAGES OF FILMS OVER PLATES.
4. THE ROTOR FOR DEVELOPING FILMS, superseded by
5. A SERIES OF TANKS CONTAINING TWO LARGE ROLLERS.







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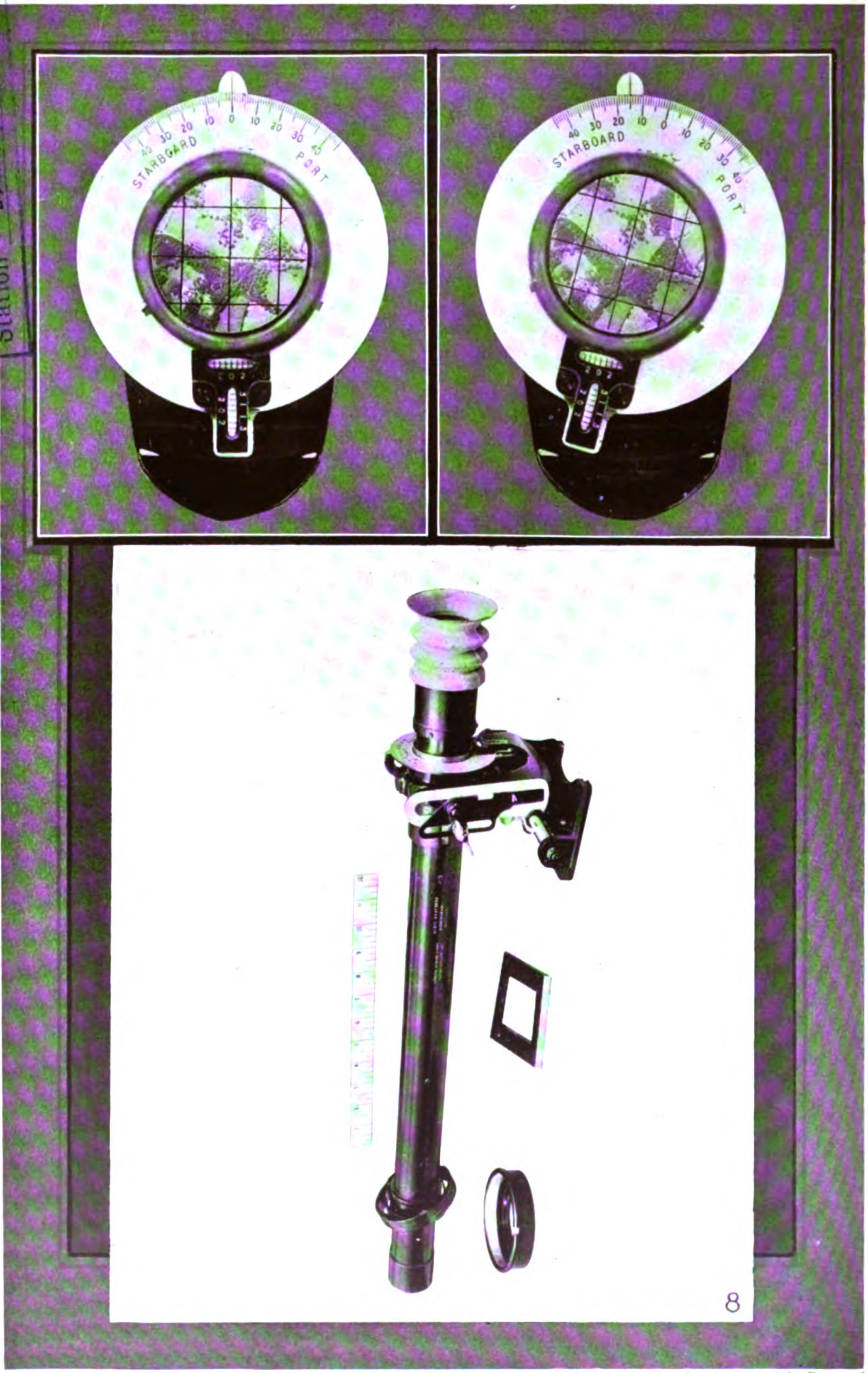
6 and 7. MODERN EQUIPMENT FOR THE PRODUCTION OF PRINTS.
9. THE TYPE 8 CAMERA MOUNTING.



8. THE "ALDIS" CAMERA AIMING SIGHT.

plates. Corrections for tilt are made on the table (*a*) and the scale adjustment is a simple movement at (*b*). Unlike its predecessors the projections are made vertically downwards on to a flat easel. This is a distinct advantage over the older models. The range of movement for projecting the image provides for negatives to be enlarged three times, or for a one-third reduction; also for any of the intermediate stages between these two scales.

For contact printing a very neat all-metal printing box (Fig. 7) has been evolved. This model forms part of the equipment normally issued with the type F.8 camera. The films, complete on spools, are attached to the box at (*a*) and (*b*). As each negative is dealt with it is passed from one spool to the other and printing continues. A pressure pad (*c*) is brought into operation by means of a foot pedal. Immediately the paper and film are in close contact the same operation switches on a light which governs the exposure. There is an adjustment at (*d*) for controlling the volume of the light. Metal boxes are carried on either side of the printing box containing paper, one side unexposed and the other exposed. A well-trained photographer can turn out 200 prints per hour on this machine.

I do not regard this machine as having reached any degree of finality. I visualize in the future an automatic printing, developing, washing and drying machine electrically controlled, in which large drums of sensitive paper will be passed automatically over the negatives, where an exposure will be made, and then through the various compartments until it emerges from the drying compartment a complete photographic print, washed and dried.

With this machine it will be possible to produce several thousands of prints per hour utilizing the services of only one man, who need be only semi-skilled, thereby effecting a great economy in the establishment of photographic sections.

Photographic Flying.

The perfection of completely automatic air cameras has very largely removed the necessity for training the crew of an aircraft employed on photographic flying in anything other than the most elementary knowledge of photography. It should suffice if they are conversant with the method of starting and stopping the camera and changing the magazines. The increasing importance of air survey has changed the photographic problem to one of extremely accurate navigation over predetermined strips of possibly unmapped country, not in the ordinary sense that one flies from A to B, but in such a manner that the flying bears a direct relation to a straight line drawn on the ground from A to B, and that the country over which this flying is taking place is unmapped or very indifferently mapped.

The course must be flown by D.R. methods and constantly checked. A solution to this lies in some form of navigating sight, preferably one in which the view of the ground to be photographed is seen through an optical system. The most successful sight so far produced is known as the "Aldis Camera Aiming Sight" (Fig. 8). This sight embraces a field of about 70 degrees, the image being produced at an eyepiece some 3 feet above the objective lens. It is mounted at the base on a small gimbal, or universal joint, and at the top on a bracket with a fore and aft and lateral adjustment. This facilitates adjustment and enables the sight to conform to the same angle as the optical system of the camera. A graticule, engraved with the area covered and drift line, appears flat on the image (Fig. 8). The whole sight may be rotated about its axis for drift. A dial is provided giving the necessary drift angle. When this has been read the camera is rotated through the same angle. The drawback to this sight may be summarized as embracing insufficient field and the absence of eye freedom. A solution is therefore required which will provide for a much greater angle and more eye freedom, and a sight which may incorporate mechanical means for reading W.S. & D.

Camera Installation and Mounting.

The influence of air survey is again evident in this section.

The mounting of a camera for photography of a tactical nature need only embody such devices as may be available for the elimination of the adverse effects of vibration, whereas if the photographs are employed for survey the accuracy demanded in the levels of the camera necessitates the provision of adjustments in all directions, including a central rotating rim for the correction of drift.

The type 8 (Fig. 9) embodies these adjustments, but it will be seen that the system of bell-cranks and springs, so efficient in converting all movements into the harmless vertical one, is not employed. A combination of the principles in this and the Universal mounting, described in my previous paper, will no doubt eventually emerge to the common benefit of Tactical and Survey photography.

The type 8 is of all-metal construction, lighter and much smaller, all of which are points in its favour.

Portable Dark-room Accommodation.

The necessity for mobility of squadrons, together with the movement of Army Co-operation squadrons to camps and manœuvres, has been sufficient incentive to produce strenuous efforts in providing a really self-contained photographic section.

The latest type trailer and tent is complete with all essential equipment for handling roll films and printing therefrom.

It consists of a trailer with tent covering, and a separate tent inside which is also a separate dark-room tent. A lighting set provides the illuminant for the printing and for general illumination of the section.

Trials recently carried out have produced excellent results.

Turning to (*b*), *i.e.*, the application of air photography to surveying, it is unnecessary to make out a case to establish its importance, but an extract from " Report on the Survey of the Western Front," published by H.M.S.O. in 1920, is of considerable interest. Under the heading of " Introduction " will be found the following passage:

" AIR PHOTOGRAPHY.

> " Air photography is of fundamental importance to survey in war. A clear policy should be laid down for co-operation between airmen and surveyors, and research should be carried out in the development of methods and apparatus, for use both in the air and on the ground."

This passage affords an excellent opening for a brief reference to the developments which have taken place in air survey during the past ten years. The recommendations made in the report were adopted, and a representative Inter-Service Committee formed under the chairmanship of the head of the Geographical Section, General Staff, War Office. Its constitution was as follows:

Chief of the Geographical Section, General Staff.
One member nominated by G.S.G.S.
One member nominated by D.G.O.S.
Two members nominated by the Air Ministry.
One part-time Secretary nominated by G.S.G.S.

The functions of the Committee are:

(*a*) To encourage research in apparatus and methods.
(*b*) To maintain a record of information.
(*c*) To arrange for the interchange of information with any scientific departments that may be interested.

This Committee was later augmented by a representative from the Admiralty.

The first report by the Committee was issued and published in 1923 (H.M.S.O.; price 4s. 6d.). As a result of the formation of this body, a very close co-operation has since existed between the Royal Air Force and the surveyors. The representatives of both sides have worked with one common object in view, *i.e.*, progress in this new method of survey.

I should exceed by far the space allotted to this article if I attempted

to go into any detail of the achievements of this Committee. It is a subject which might well form the basis of an extremely interesting article for this journal, and I hope that the Editor will adopt my suggestion that he should secure the services of one of the surveyors on the Committee to write an article for the next number of THE ROYAL AIR FORCE QUARTERLY.

I do not consider, however, that I should be trespassing too far if I gave just sufficient information to show what has recently been accomplished in mapping from air photographs. It has been stated that in future operations we cannot be content to show, as heretofore, only such features as roads, railways, houses, etc.—in many places they do not exist. We must, if necessary, show individual trees, clumps of gorse, rocks and any other feature which is sufficiently characteristic and conspicuous to enable other features on the map to be pin-pointed on it by direct visual observation.

It is only since the development of air survey that the production of such a map could be contemplated. The developments in this direction are now at a stage in which the surveyor is satisfied that such a map can be produced if the airman can supply suitable photographs. I am satisfied that the airman can supply all that is needed. A number of exercises have shown that, given reasonable weather conditions and the equipment I have already described, there are no insuperable difficulties. To quote one example: A map was prepared for a recent Aldershot Command Artillery Exercise. It covered an area of approximately 80 square miles and was made up of four strips of photographs, each about 10 miles in length. These strips were plotted in something under eight hours, utilizing the services of one non-commissioned officer and seven other ranks, and the whole map drawn up by the same section in something under forty working hours. The method employed for the production of these maps is commonly known as the "Arundel Method."

A very complete set of publications on this subject, written by Captain M. Hotine, R.E., who has been employed for some years as research officer to the Committee, are on sale at H.M.S.O. Although they deal with a highly technical subject they are written in a manner which will be easily understood by anybody sufficiently interested in the subject. The publications are issued as professional papers of the Air Survey Committee. Those recommended are:

No. 3: "Simple Methods of Surveying from Air Photographs," 1927 (3s. 6d.).
No. 4: "The Stereoscopic Examination of Air Photographs," 1927 (3s. 6d.).
No. 5: "Calibration of Surveying Cameras," 1929 (2s. 6d.).
No. 6: "Extensions of the 'Arundel Method,'" 1929 (4s.).

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THE DE HAVILLAND INTERCEPTOR FIGHTER.

Fitted with the Napier H Air-cooled Engine. The engine is rated at 300 h.p. at 3,850 r.p.m. and weighs 620 lb. This is one of the most interesting and successful aircraft of its type so far built.

[R.A.F. Official: Crown Copyright Reserved.

THE HAWKER HORNET INTERCEPTOR FIGHTER.

Rolls-Royce F.S. Type Engine. One R.A.F. Squadron is being re-equipped with this type.

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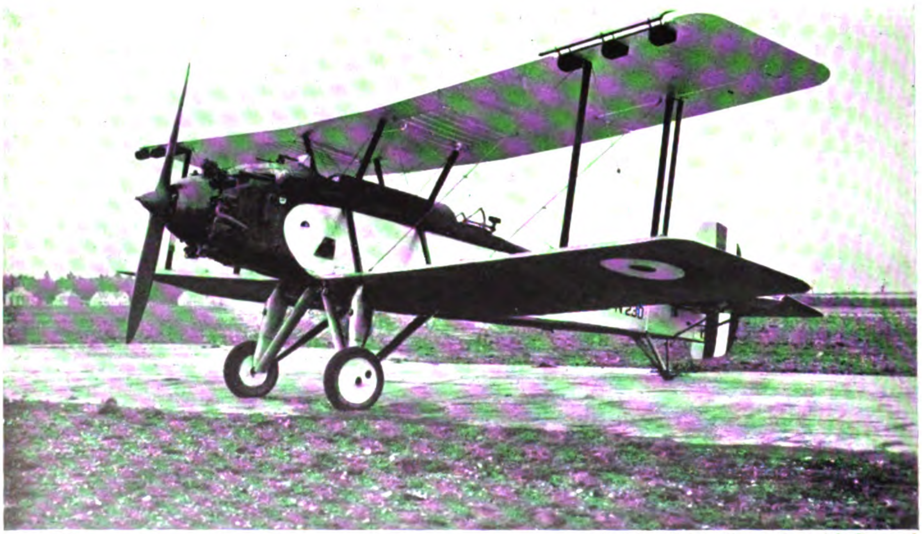
THE VICKERS NEW TYPE FOUR-SEATER NIGHT BOMBER.

Fitted with Two 480 h.p. Rolls-Royce F Engines. This aircraft has a greater speed than standard types and embodies many other improvements.



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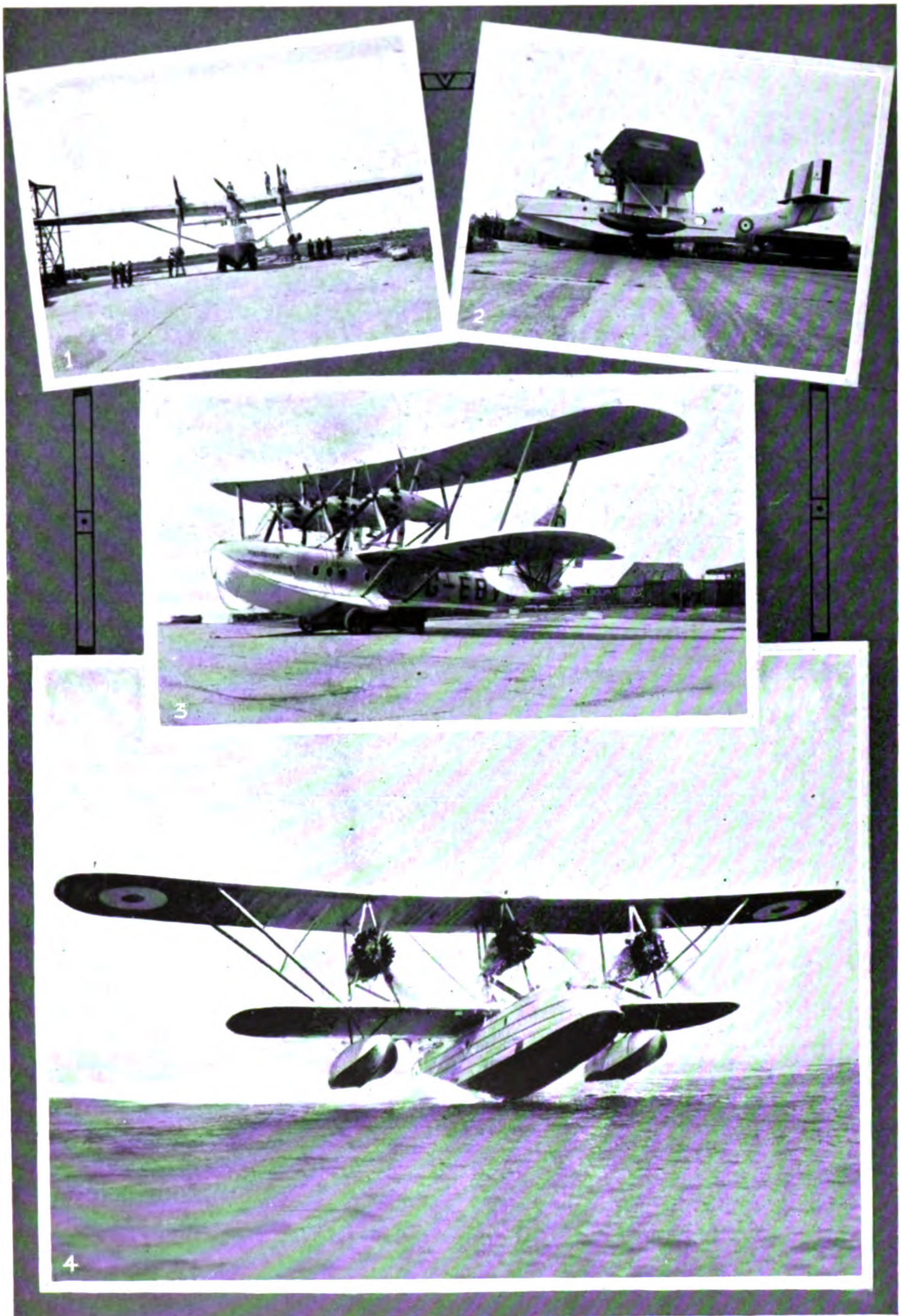
THE VICKERS VILDEBEEST TWO-SEATER BOMBER-TORPEDO AIRCRAFT.

Fitted with a Bristol Mercury Engine.



(No. 3. *R.A.F. Official: Crown Copyright Reserved.*

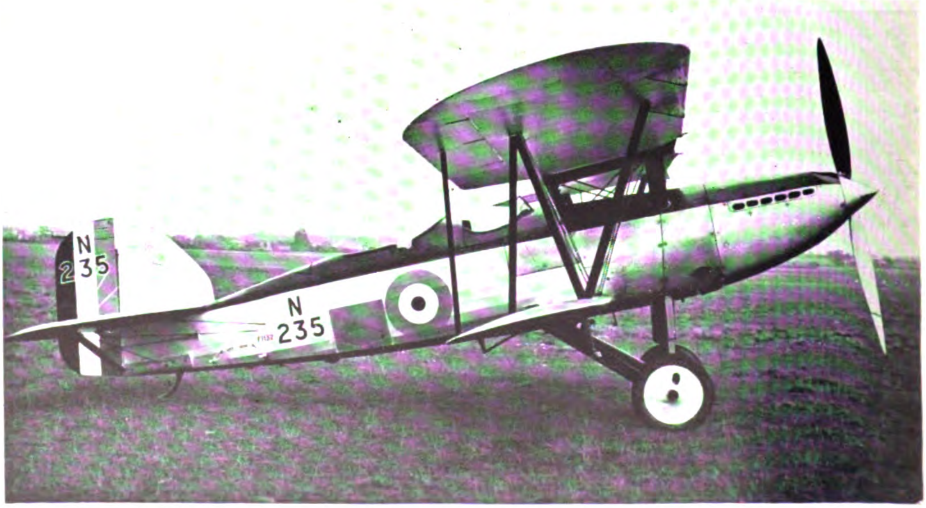
1 and 2. THE BLACKBURN SYDNEY. Three Rolls-Royce F Type Engines.

3. THE SHORT CALCUTTA, MILITARY TYPE.

4. THE SUPERMARINE SOUTHAMPTON MK. X. Three Armstrong-Siddeley Jaguar VI Engines.

[Copyright: Beken & Son, Cowes, I. of W.

THE SAUNDERS-ROE A.7 ALL-METAL FLYING BOAT.
Three Bristol Jupiter IX Engines.



THE FAIREY FLEET RECONNAISSANCE FIGHTER.

NEW ZEALAND AIR FORCE

NEW ZEALAND SUPPLEMENT

[Photo: S. P. Andrew, Wellington.

WING-COMMANDER S. GRANT-DALTON, D.S.O., A.F.C., q.s.
DIRECTOR OF AIR SERVICES, NEW ZEALAND AIR FORCE.

NEW ZEALAND AIR FORCE

G.H.Q., Wellington.

Director of Air Services ...	Wing-Commander S. Grant-Dalton, D.S.O., A.F.C.

N.Z.A.F. Base, Auckland.

Officer Commanding	Squadron-Leader L. M. Isitt.
Instructor	Flight-Lieutenant S. Wallingford.

Wigram Aerodrome, Christchurch.

Officer Commanding	Flight-Lieutenant M. W. Buckley.
Instructor	Flight-Lieutenant H. B. Burrell.
Equipment Officer	Flying-Officer T. J. Denton.

Duty with Royal Air Force.

Dominion Liaison Officer ...	Squadron-Leader T. M. Wilkes, M.C., Air Ministry, London.

Historical.

PRIOR to 1914 the only service aircraft in New Zealand was an 80 h.p. Bleriot landplane presented to the Defence Department by the Imperial Air Fleet Committee of the Overseas Club. This machine was dispatched in 1914 to augment the equipment of No. 1 Australian Flight.

During the war two civil flying schools were operated, training pilots for the R.F.C., R.N.A.S. and R.A.F.

It is here that tribute must be paid to the pioneers of aviation in New Zealand. Sir Henry Wigram, who was directly responsible for the formation of the flying school in Canterbury, has done more than anyone to develop flying in New Zealand, and has always urged the importance of flying from the point of view of defence. Sir Henry has the satisfaction of knowing that the school trained no fewer than 186 pilots during the war. It was by his generosity that the school remained in active operation until 1923, and when finally taken over by the Defence Department he made a personal gift of £10,000 towards the purchase of the station.

Messrs. Walsh Bros., who can claim to have made the first flight in New Zealand, having built and flown their own machine in February, 1911, established a flying school in Auckland, using seaplanes and flying boats, and trained 110 pilots.

Both flying schools operated during the war under the great handicap of scarcity of flying equipment—the greater number of their aircraft being built locally. Over 300 New Zealanders served as officers in the British Flying Services during the war, and at the time of the armistice there were 142 cadets in training.

Immediately after the war the Air Ministry, at the invitation of the New Zealand Government, sent Wing-Commander A. V. Bettington, C.M.G., to report on Air Defence in New Zealand. The Government could not face the cost of the complete scheme, but endeavoured to provide some degree of Air Defence on a civil basis by:

(*a*) Subsidizing Air Transport.
(*b*) Forming a Reserve of Officers, whose flying training was undertaken by the two existing flying schools.

These proved inadequate, and in 1923 the Permanent Air Force was formed to undertake the training of the Reserve of Air Force officers.

The Force to-day consists of the New Zealand Permanent Air Force and the New Zealand Air Force, which is a unit similar to the R.A.F. Reserve of Officers. Both units were formed on June 14th, 1923.

Organization.

G.O.C. New Zealand Military Forces.
|
Director of Air Services.
|
Civil Aviation, N.Z.A.F. Base. | Wigram Aerodrome.

At the invitation of the New Zealand Government, Air Chief Marshal Sir John Salmond, K.C.B., C.M.G., C.V.O., D.S.O., made an inspection in 1928, and submitted a comprehensive report on Air Defence in New Zealand, and it is expected that development will proceed along the lines of his recommendations.

New Zealand Permanent Air Force.

During the past year Royal Air Force titles have been adopted in the New Zealand Air Force, although an Army unit working under the General Officer Commanding.

The strength of the New Zealand Permanent Air Force is now eight officers and forty-two other ranks, an addition of two officers and

[Photo: Broma Studio, Nelson.

THE PERFECT MOUNTAIN.
Mt. Egmont (8,250 ft.), Taranaki, North Island, N.Z.

[Photo: Broma Studio, Nelson.

SCENE IN THE SOUTHERN PART OF NEW ZEALAND.
Bobs Cove, Lake Wakatipu, Otago, South Island.

[Photo: *Broma Studio, Nelson.*

MAGNIFICENT MOUNTAIN SCENERY.
The Lion and Mt. Pembroke, Milford Sound, South Island, N.Z.

[Photo: *Broma Studio, Nelson.*

THE MOST BEAUTIFUL OF ALL NEW ZEALAND SCENERY.
Arthur River, Milford Track, Southland, South Island, N.Z.

twenty-five other ranks over that of last year. These numbers include fifteen apprentices who are undergoing training at Wigram Aerodrome.

A Royal Air Force officer, Wing-Commander S. Grant-Dalton, D.S.O., A.F.C. (R.) was appointed Director of Air Services on October 1st, 1929, for a term of two years. This appointment combines the duties of Officer Commanding New Zealand Air Force and the Controller of Civil Aviation.

During 1929, Squadron-Leader T. M. Wilkes, M.C., left the Dominion to act as Liaison Officer at the Air Ministry, London.

Squadron-Leader (Temp.) J. L. Findlay, M.C., whilst undergoing R.A.F. Courses in England, passed out of the Central Flying School at Wittering as an A-1 instructor, which is the highest qualification obtainable.

New Zealand Air Force (Territorial).

The strength of this unit is ninety officers and nineteen other ranks.

Aircraft and Equipment.

At Wigram Aerodrome the Department maintains seventeen aircraft of the following types:—

(a) Service: Three Gloster Grebes and six Bristol Fighters (the latter being obsolescent).

(b) Training: Four Avro 504K and four D.H. Moths.

The aircraft held at Hobsonville Seaplane Base consist of two Fairey IIIF's and one D.H. Moth, all of which may be used either as seaplanes or landplanes.

A small two-engined flying boat has been ordered for use at Hobsonville. This aircraft will be used in training pilots for future employment on the large flying boats recommended for coastal reconnaissance work.

CIVIL AVIATION.

The development of civil aviation in New Zealand has been retarded by the cost of providing adequate ground organization, and the difficulty experienced in selecting suitable landing grounds. Local bodies throughout the Dominion, however, now realize their responsibilities in this direction, and are making strenuous efforts to provide suitable aerodromes in their own districts. Selected areas on possible air-line routes are being constantly examined and classified by Air Force officers. At present there are, apart from the two Air Force stations, seven aerodromes licensed for use of light planes, and approximately a dozen others in various stages of development.

CIVIL AVIATION IN NEW ZEALAND

By J. T. Crawford, Editor, *New Zealand Air Journal.*

In the face of a certain amount of public apathy, civil aviation has become firmly established in New Zealand during the past eighteen months (I am writing at the end of June, 1930). Except for the Government Defence aircraft, there were, eighteen months ago, only two or three 'planes in New Zealand, no active aero clubs or club-trained pilots, no civil aerodromes or landing grounds, and only an infinitesimal proportion of the Dominion's people had ever been up in a 'plane.

Then came the visit of Kingsford-Smith in "The Southern Cross," which was the first and, so far, the only 'plane to cross the Tasman Sea. That was in September-October, 1928, and it was from then on that the Dominion's civil aviation began to show signs of life. Within a few months aero clubs had been formed throughout the country and the Government had promised a subsidy to those which it approved.

Eight approved clubs are now in existence, seven of which have started flying operations, while the eighth has a ground and should have a 'plane before the end of next summer.

The following brief table gives some of the latest available figures in connection with these eight clubs. In regard to the number of 'planes, it must be pointed out that most of the clubs began with less than are quoted here, having acquired others as their funds and activities grew. It must also be noted that nearly every club has had aircraft out of action from time to time owing to mishaps.

Club.	*Commenced Flying.*	*No. of Machines.*	*Pilots Trained.*
Auckland	February, 1929	6	32
Hawke's Bay	March, 1929	3	16
Western Federated	April, 1930	2	—
Wairarapa	May, 1930	1	—
Wellington	February, 1930	4	7
Marlborough	February, 1929	3	22
Canterbury	May, 1929	2	14
Otago	—	—	—

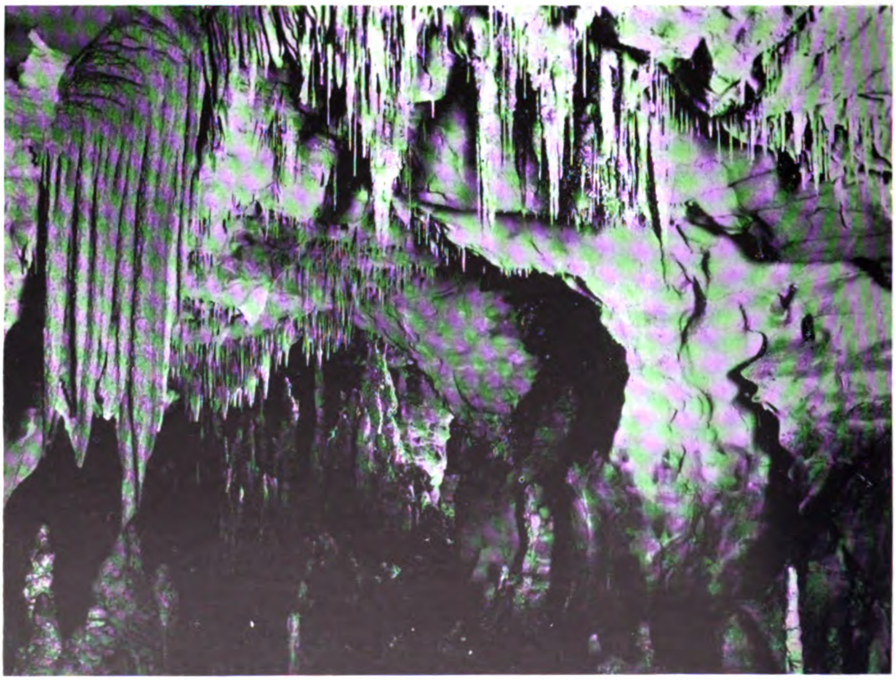
These recognized clubs alone have a total membership of well over three thousand, and there are, in addition, about half-a-dozen other small clubs, so that it is obvious that civil aviation has a large number

[*Photos : Broma Studio, Nelson.*

1. A GOOD STUDY OF MAORI WAHINE. Maori Woman and Child, Rotorua, North Island, N.Z.
2. A REAL OLD MAORI. (A Good Joke.) A Maori Study, North Auckland, N.Z.
3. MAORI WAR DANCE. Maori Haka, Rotorua, North Island, N.Z.

[Photo: Broma Studio, Nelson.

A BLOW HOLE IN THE THERMAL REGIONS, NORTH ISLAND, N.Z.



[Photo: Broma Studio, Nelson.

NEW ZEALAND POSSESSES SOME WONDERFUL CAVES.
The Blanket Chamber, Waitomo Caves, North Island, N.Z.

of active supporters in New Zealand. The great crowds which have attended the air pageants organized by the different aero clubs during the past two summers provide further evidence of this.

Up to June 14th, 1930, there were fifty-two aircraft registered in New Zealand, but some of these have crashed and actually only forty-odd are in active commission, the types represented being D.H. *Moth*, Simmonds *Spartan*, Avro *Avian*, Desoutter, Saro *Cutty Sark*, and Blackburn *Bluebird*. There are about twenty professional pilots engaged either as club instructors or commercial pilots; a number of ground engineers and mechanics; nearly a hundred club-trained pilots; and fourteen towns with prepared landing grounds, eight of which also have hangar accommodation. It is estimated that during the past eighteen months over ten thousand New Zealanders have been taken up for passenger flights.

The most important development in the aero club movement of recent months is the formation of the New Zealand Aero Club, which is constituted by representatives of all the clubs officially recognized by the Government, and which may eventually become affiliated to the Royal Aero Club of Great Britain. This body should do much to further the cause of civil aviation in New Zealand and to help the individual aero clubs, for there is strength in unity. Already it is considering several important questions such as insurance for aircraft and pilots and the preparation of special visibility charts for airmen.

The Government has given valuable assistance to the aero clubs. To approved clubs with satisfactory aerodromes, good membership and funds, it grants a subsidy of twenty pounds for every male member under thirty years of age who qualifies for his "A" licence, but only pays this subsidy for twenty members per club per annum. It also lends aircraft to clubs, assists air pageants, and advises generally on aviation matters. The Government Meteorological Office at Wellington has done some good work, under Dr. E. Kidson, in making weather investigations of special value to airmen.

Apart from the aero clubs, civil flying has not developed greatly in New Zealand. There are at present about a dozen aircraft engaged by commercial concerns in giving passenger flights and undertaking air-taxi work; about six privately owned aircraft; and one aeroplane flown by a business firm for its own use. As yet there are no regular air services, but a company known as Dominion Airlines, Ltd., has been formed for some time and is to commence operations with a *Cutty Sark* flying boat next October, their first regular service being between Wellington, in the North Island, and Nelson, in the South. Plans have been made for eventually running a comprehensive system of services throughout the Dominion, the full organization calling for a fleet of eleven aircraft. The Government has so far refused a subsidy

to any commercial concern, but the company referred to considers that it can make its initial service pay on its merits.

So far New Zealand has been very fortunate in having few air accidents. Since 1919 there have been seven fatal accidents, including both military and civil flying, involving twelve deaths. Only three of these, involving five deaths, have occurred in the past four years. Not one aero club pupil has been killed or even badly injured, although one or two aero club 'planes have been seriously damaged.

Among notable flights carried out in the Dominion during the past few months have been that of Mr. J. D. Hewett from Dunedin to Auckland non-stop, a distance of 830 miles, in ten hours in a *Gipsy Moth;* and that of Flight-Lieutenant M. W. Buckley in a *Fairey IIIF*, belonging to the New Zealand Air Force, who flew from Christchurch to Auckland non-stop, a distance of 532 miles, in three hours forty minutes, averaging 145 m.p.h., an air speed record for New Zealand.

In closing, one can only give a brief forecast as to the future of civil aviation in New Zealand. Within the next year air services are to be established, the New Zealand Aero Club is expected to become active, and at least one more aero club will be flying. By the end of 1931 there should be, at a conservative estimate, a hundred civil aircraft and two hundred and fifty club-trained pilots in the Dominion.

New Zealand has been slow to realize the possibilities of aviation and slow to begin flying activities, but now that she is properly under way it can be confidently expected that there will be no looking back.

WITH THE ROYAL FLYING CORPS

By G. O. M.

Chapter I.

It seems strange to think how little I knew about flying and the Royal Flying Corps in 1915.

I was in a young officers' camp in East Yorkshire, spending the days in wearisome routine work and awaiting impatiently my turn to go out to France. I was convinced that the war would be over before I could get out and put all this theoretical war making into practice. Someone—I believe it was dear old Major Lock, of my regiment—said to me one day: " If you're in such a hurry to be killed, why don't you apply for the Flying Corps? They are asking for light-weights who can ride, and ski, and know Morse and Semaphore, and all that kind of thing. They give them three weeks' training, and then send them out to France as observers."

I began to make inquiries. The first thing I discovered was that Flying Corps pay was much better than ours, and that even as an attached or seconded officer I should benefit considerably. Then I heard that people were tumbling over each other trying to join the Corps. To some, the idea of emptying bombs into Germans in bulk made more appeal than trying to stick them individually with a heavy rifle and bayonet. Being something of an Ortheris* myself, I was of the same opinion.

I decided to have a shot at it; and, a week later, was interviewing Major Warner at the War Office.

Room 142, the War Office! How things have changed since those days!

In the room were two officers—Major Warner himself, and a middle-aged man in the uniform of a Second-Lieutenant of the Royal Flying Corps, Special Reserve. I regarded him with interest while he took down my particulars, for it was the first time I had seen the

* Immortalized by Rudyard Kipling. One of a trio of soldiers: Mulvaney (an Irishman) Learoyd (a Yorkshireman) and Stanley Ortheris (a Cockney) run through Kipling's, Works but also in " Soldiers Three."

high-necked double-breasted tunic of the Corps. Here I cannot refrain from saying something concerning that uniform, and the men who wore it until April, 1918, saw the end of the Royal Flying Corps in the birth of the Royal Air Force.

I was a soldier myself, and never wore the tunic even after I had been seconded, and the same may be said of hundreds of attached and seconded officers; but yet I think that, for all of us, that uniform stands in our minds as a symbol of the finest body of gallant English gentlemen who have ever gone out to meet death with a laugh or a jest on their lips.

Let us go back to Room 142.

The Second-Lieutenant finished the dossier, and initialled it, and I suddenly realized why his face was vaguely familiar. He was Lord Hugh Cecil.

Major Warner asked me a few questions concerning my weight, where I did my hunting, and so on (he looked disappointed when I had to admit that I hadn't ridden the Cresta), and then asked me whether I would like to go on the pilots' waiting list or the observers'. He wanted to put me on the observers', on account of my light weight, and held out as an inducement that he would be able to send for me in a fortnight as an observer, but that as a pilot I might have to wait several weeks. That settled it for me. I said, "Observer, then, please, I've been waiting six months already."

Rather more than a fortnight later a telegram arrived at Hornsea, instructing me to report to Fort Grange forthwith. "I suppose that means your flying job," said the C.O., "but I'm damned if I know where Fort Grange is. I believe it's on the Caledonian Canal."

We had to wait quite a long time before Humber Defence Headquarters in Hull succeeded in discovering that Fort Grange was one of the ring of forts round Portsmouth!

On the journey South, I learnt Morse furiously. I regret to have to admit that when talking to Major Warner I had claimed full knowledge of both Morse and Semaphore, whereas really I didn't even know the alphabet of either; but I trusted to luck and diligence to pull me through. Here I may say that I never have succeeded in learning Semaphore, in spite of hours of tuition and practice at the hands of Flying Corps, Army, and Naval instructors. There seems to be something about that horrible flag-wagging in a series of circles which has a softening effect on my brain.

Fort Grange was a new and delightful world. I had never been inside a fort before, for one thing; and the semi-subterrainity of our quarters seemed quaintly satisfactory. The time of year was June, so cold and damp did not bother us. Indeed, after living under canvas for so long, the quarters seemed luxurious.

Immediately inside the moat and drawbridge-guarded perimeter of the fort lay the aerodrome, with a line of corrugated iron sheds on one side, standing back from a broad asphalt roadway which I quickly learned was known as "The Tarmac," a designation which I suppose will for all time be applied to the areas in front of flying sheds, whether they be asphalt, concrete, wood, or beaten earth.

Standing outside these sheds were three or four aeroplanes in various conditions of serviceability, and it may be imagined with what interest I surveyed them. I got hold of an observer from the previous course, and persuaded him to take me round and identify everything. There were hardly two machines alike. Pusher biplanes were represented by blue-painted Caudrons with corrugated wings; and Maurice Farman Longhorns and Shorthorns, the former distinguished from the latter by the elevator which they carried in front. Tractor biplanes were represented by the Royal Aircraft Factory productions of the B.E.2A., B.E.2B., and the Bloated (I forget the technical name of this last; it was a heavy-looking, deep-fusilaged affair harnessed to a poor little 50 h.p. Gnome engine). The only monoplane was the Bleriot, which I proudly recognized, for I had been for a flight in one with B. C. Hucks before the war.

There were about eight of us on the course, and for the next fortnight we practised signalling, attended lectures and went up on practice reconnaissances on which we had to write reports. We also practised artillery observation, both from the air and in a hangar where a model village and trench system had been built, enabling the would-be observer, mounted in the roof, to spot and locate the flashes of tiny bulbs concealed variously over the ground. Locations and corrections were signalled down by the observer by means of a morse buzzer. This was in June, 1915, and I do not believe that the training of observers was, or could have been, any better carried out throughout the years that followed. I do not know to whom the chief credit was due, but Capt. Wyllie, of the Hampshire Territorials (son of the famous painter), a pilot who had been flying in France, and a subaltern who afterwards, as a Lieutenant-Colonel, commanded the Training School at Reading, and who, I believe, had served with the 4th Hussars during the Boer War, were our chief instructors. They set a high standard, too! I'm afraid I must have a very low sense of honour, for, in order to make sure that my final reconnaissance report should be satisfactory, I borrowed a car and did a *ground* reconnaissance of the rolling stock in Eastleigh Junction, and various other local features, before handing in my report. The authorities had just instituted a badge for observers. It took the form of a wing, elevated, and ending in a large O. It was to be worn, like the familiar pilot's double wings, above the space where the medal ribbons were not. A fellow

called McArthur (later killed in France), and myself, were the first two recipients of this decoration, which we disliked intensely. It was bad enough to be an observer, without having to carry the badge of infamy about with us. Fortunately, when we joined No. 12 Squadron at Netheravon, we were ordered to take the wing off again, as it had been decided not to grant it until some service in the field had been satisfactorily completed.

Observers were of no account in those days—indeed, I do not think they have ever attained to a measure of the dignity of their pilots, except in the Fleet Air Arm. This was not the official view, of course —merely the much more important social one. Observers were ballast, useless heavy impedimenta, ullage, who must be sat upon and squashed and made to feel their inferiority. As practically every observer looked with longing to the day when he would himself be a pilot, this attitude seemed quite natural to him. One of the eight on our course was Lord Lucas, who had lost half a leg in the South African War and could not persuade the doctors and Major Warner that that would not prevent him from being a pilot. However, he persuaded Lieut.-Col. Ashmore (then commanding the Gosport Wing) to let him try, and by the time we went our separate ways he was well on the way to proving himself right. He got his way eventually, by being able to say: "You say I can't fly, but I've done it!" He was afterwards killed in France.

Lieut.-Col. Ashmore and Majors Todd and Herbert, commanding Nos. 14 and 17 Squadrons respectively, all helped to make life a joy. Guest nights were terrific affairs, and everyone shoved their damndest in the scrums in the ante-room afterwards. I don't care about mentioning names much, for nearly all of them are dead. It was at Gosport (Fort Grange) that I first saw an aeroplane loop. The Honourable John Tennant brought a B.E.2C. over from somewhere or other, and took up the C.O. and looped with him. When Ashmore was asked afterwards what it was like he replied in two words, the first of which was "Absolutely."

The atmosphere of the station was more like that of the VIth Form than of a military unit. Perhaps if I say it was like that of a good cavalry regiment I shall make myself understood to soldiers. Everyone was an enthusiast, and the sight of the Air Mechanics at drill, and on the march, was a pleasure. Even the ex-Coldstream Sergeant-Major was satisfied: as satisfied as a Sergeant-Major ever is, or should be, that is to say.

The majority of the engines were of French manufacture—Renaults and Gnomes, and of course the Farman, Caudron, and Bleriot machines were all French; so we had a staff of skilled French riggers and fitters to maintain both engines and machines until our own men

had attained proficiency. The Frenchmen knew their job thoroughly, but set about in it a typically continental mechanicish manner, and the contrast between their appearance and behaviour, and that of our own men, would have reduced even the Adjutant of a Regiment of Australian Horse to tears. Provided the work was done quickly and well, and machines were kept in the air, no one cared a tinker's curse. I hesitate to say the number of hours per day which some of those N.C.Os. and men put in when their machines were temporarily out of action, but of course this whole-hearted zealous work was typical of every Flying Corps station in England and abroad throughout the war. Everyone took it as a matter of course. Very few orders had to be given, and scarcely any supervision was exercised, except at moments of critical work where the higher skill of the N.C.O. might be necessary. Of course nothing could keep the pilot away from his machine. Were he a Strange, or a Rees, or a Spratt, he would do most of the work himself; but others, less qualified, hung round anxiously or impatiently and were only too pleased to lend a hand at holding a pair of steps, or some such housemaid's work. Pilots—then, now, and always, I suppose—are gluttons for work, provided that it means getting into the air; and the only ill-feeling or jealousy that ever arose between them was on account of there not being enough machines, or jobs, to go round. This still held good, even when it came to a particularly suicidal trip over into Hunland. The lack of popularity of one who crashed a machine may be imagined. Well for him if he did it in a highly spectacular manner where everyone could see him. In the joy of seeing a good hearty crash, much was forgiven—except by an enraged Flight Commander, one of whom I remember making a miserable pupil, who had crashed particularly foolishly, spend the night out on the aerodrome guarding the wreckage.

I saw two amazing accidents during the three weeks I was at Gosport. The pilot of a Caudron (which had a gliding angle like a brick and had to be brought down in a sort of nose dive) had been up a long time, and his Flight Commander became concerned about the petrol supply. He tried all means of getting the fellow down, including firing rockets and having every other machine put away, and eventually the Caudron *did* land—only to take off again immediately. The pilot then proceeded to practise landings in different parts of the aerodrome, while a furious Flight Commander raced up and down the tarmac, and sent men out in all directions to stop him. When taking off for the last time, the Caudron's petrol supply gave out, and the machine went straight into the moat. It was a lovely crash, and of course everyone was there to see it.

"I hope, oh I *do* hope, the ——'s dead!" exclaimed the Flight Commander.

Of course the pilot *wasn't* dead, but he *did* have to go to hospital for a week or two.

The other crash concerned a Maurice Farman. The pilot had accidentally stopped his propeller well over on the far side of the aerodrome, and, rather than wait for mechanics, he got out and swung it himself. Unfortunately he had left the throttle too far open, and the engine not only started, but the machine took off on its own, knocking down the misguided enthusiast with its tail in the process. Of course it crashed immediately.

Chapter II.

Netheravon was quite different from Gosport. One would have expected, as it was an isolated station stuck out on Salisbury Plain miles from anywhere, that it would have been even more of a happy family kind of place than Gosport. But it was not.

The hangar end of the camp was nearly a mile from the quarters and mess, and was much more detached and scattered than at Fort Grange. This meant that you did not see much of those outside your own flight. Also, just because the nearest town—and that a dull one—was Salisbury, fourteen miles away, everyone seemed to make a point of going there in the evening. So the mess was dull.

I was stationed at Netheravon again in 1919, and found things very much the same. It seems rather curious.

Major C. L. N. Newall was in command of No. 12 Squadron, which was rapidly being equipped with B.E.2Cs. in preparation for embarking for France. George Aubrey Kennedy Lawrence, Binney, and Strange were the three Flight Commanders. McArthur was attached to "B" Flight, under Binney, and I went to "C," under Strange. There were five other observers already there—Garrod, Perrin, Gray, Whitehead and Windsor; and it is a remarkable fact that of the seven, five are alive to-day.

I cannot remember who commanded the station, and I only remember doing one bit of work during the fortnight I was there—this was learning something about the Lewis gun, under a dear old fatty called Cheney.

Most of the machines were Avros and Henry Farmans, both driven by 50 h.p. Gnomes. The Avro needs no description, for it had hardly altered up to 1926, except that the engine became a 100 h.p.; but the Henry Farman was a pusher biplane something like its cousin the Maurice Farman, only lighter, and consequently more difficult to fly. No. 11 Squadron, equipped with Vickers Fighters, had left for France just before we arrived.

When the time came for us to go overseas, the pilots flew the machines to Folkestone, and then across to St. Omer, while the transport was embarked at Avonmouth and shipped across to Le Havre. We observers and the rest of the squadron crossed to Le Havre in one of the tiny lake steamers which were doing duty as transports, but I cannot for the life of me remember where we sailed from—probably Southampton.

After two or three days in Le Havre, we started on the long journey across Northern France to St. Omer. The motor transport of a squadron was very considerable, consisting of a touring car, six Crossley tenders and six Leyland lorries, if I remember rightly, and our three-day journey in the heat and dust of late August was a tremendous affair. Of course the lorries limited the pace to not more than twenty miles an hour, and the cloud of dust which the column raised could be seen behind us for miles. The French had not yet become *blasé* about English forces, and we met with quite a warm welcome at every stoppage. We paid for everything, probably fairly dearly, and I don't think I've ever eaten so many grapes.

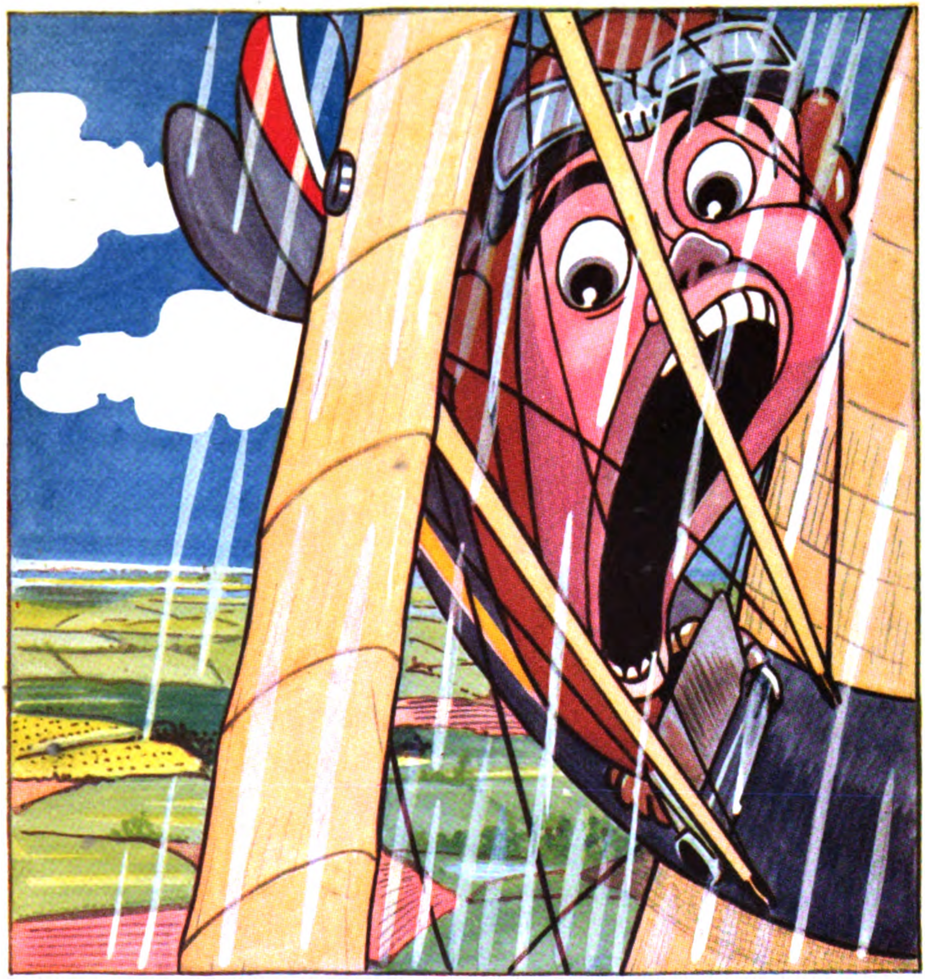
I'm afraid we five younger observers were a bit of a nuisance to the C.O., and Perrin, the senior observer, who by virtue of his Captaincy in the Cheshire Territorials and a year or two's seniority, assumed a certain measure of superiority. Windsor and Whitehead were the ringleaders, and at each stopping place from Le Havre onwards we investigated the towns, hotels, shops and cafés, like a pack of terriers. Marriott, the wireless equipment officer, was a fine aider and abettor. We treated the war, and particularly our manner of going to it, as a kind of glorified Cook's tour.

For a day or two after our arrival at St. Omer we lived in hotels, but very shortly we moved to our permanent billets—each flight separate in a château, or large farm-house, at some little distance from the aerodrome. "B" Flight (Binney), with Headquarters, were just at the back of the aerodrome; "C" (Strange) were at the Ferme des Berceaux, Longinesse; and "A" (Lawrence), were just beyond us. The owners had moved out, and we found ourselves with room and to spare. An eighth observer, Cunningham-Reid, joined us almost immediately, and went with Garrod and Gray to "A" Flight. Whitehead and McArthur were in B. Perrin, Windsor and myself were in "C." Our three pilots were Gordon Smith, Vyvyan Robeson, and Allan Lees.

Army and R.F.C. Headquarters were at St. Omer, and No. 12 Squadron was to take over the work of Headquarter Squadron from No. 7, one flight of which, under Norman Spratt, had stayed behind to show us the ropes, while the remainder of the squadron had already gone to their new station.

Our work would consist principally of long reconnaissance; work for which the B.E.2C., with its 90 h.p. R.A.F. air-cooled engine (R.A.F. here stands for Royal Aircraft Factory), and its equipment of Lewis gun, was considered highly suitable. "A" Flight had R.E. 5's and R.E. 7's. These were also R.A.F. machines, somewhat similar to the B.E's., but bigger and engined by a 120 h.p. water-cooled Beardmore. The only difference between the R.E. 5 and the R.E. 7 was that the latter had extensions to the top plane. In all these machines, the pilot sat behind the observer, so that the latter, sitting well under the top plane, had a forest of struts and wires to obstruct his view and field of fire. The designing of war machines was still in its infancy, and the German aviators were, as a rule, so willing to leave us alone if we would do the same by them, that no one worried about the position of the observer in reconnaissance, artillery and photography aircraft. It suited the designers much better to put the variable weight on the centre of gravity.

The R.E's. had a cruising speed of about 65 to 70 miles an hour. The B.E's. cruised at from 60 to 65 miles per hour. Both took half an hour to climb to six thousand feet, or three-quarters of an hour if loaded with bombs. Every stone made a difference, and whether we should carry a Lewis gun or not, and, if so, how few drums of ammunition, was considered on every occasion. Heavy observers were anathema, and I remember seeing Lees send Windsor back one day to take off some of his heavy flying clothing. (This was sheer bullying, of course, but people got a lot of fun out of bullying Windsor, who was one of the most engaging, amusing buffoons I've ever met.) The 90 h.p. R.A.F. engine was then still in its infancy, and had very little more power than the well-tried and proved 70 h.p. Renault, without the latter's reliability. Still, as engines went in those days, it was not bad. Lubrication was by splash from the sump, and if a machine was brought down in one continuous glide (that is to say, with the nose fairly well down) for three or four thousand feet, there was every likelihood that the front four plugs would oil up. All the bearings were of white metal, and it was by no means uncommon to run three or four of them at a time. Ten minutes with the throttle wide open was usually too much for them. The engine was steadily improved as time went on, and later, as the 100 h.p. R.A.F., did very good work. The tank capacity of the B.E.2C. would give three and a half hours' running on easy throttle. This was not considered sufficient, and Strange fitted an extra tank in his machine, to give five hours' fuel. As, unfortunately, he succeeded in getting off the ground with tanks all full and an observer and Lewis gun, it was decided that half the remaining machines were also to be modified. St. Omer was a big aerodrome, but the full extent of it was required frequently when a wretched B.E.



THE SIDESLIP.

When the bottom falls out of the world
Don't utter a sigh of dejection
If you find yourself suddenly hurled
In a quite unexpected direction:
Don't think it a bore,
This will help to restore
That long-vanished schoolgirl complexion.
For a sideslip, although it may cause you to
  shiver
Is *frightfully* good for an obstinate liver.

C. L. M.

was taking off under full load, and even then the machine required to be hauled off the ground and held up by prayers and objurgations. Pilots who have learnt to fly since 1918 would probably refuse to credit the risks we took over getting off in those days. Luckily we did not know much about flying, and had never been accustomed to anything else.

I went for my first trip over the lines with Spratt. We were to do a reconnaissance from the Ypres Salient, via Lille, to Lens. It took me all my time to recognize Ypres, but when Archie began to burst round us I gathered that we had crossed the lines. I did not at first realize that the bursts of Archie were aimed at us, and, even when they got nearer, it seemed much more interesting than dangerous. The high explosive shells burst in a lump of black smoke with a noise like "crump": the shrapnel shells burst in a longish sort of streamer of white smoke, with a noise like "wooff." If they were fairly near, or bursting against a dark cloud, you could see the red flame of the explosion as well. If shrapnel was very near, and about your own height, you could see the sun glinting on the bullets as they reached the top of their flight and began to fall. When you could see the small lumps into which the high explosive burst, you knew you were quite near enough. If a shell burst underneath you, even if it was a hundred feet or more away, it lifted the machine noticeably. I did not notice all these details on the first trip, because I was so occupied in trying to see something on the ground. It looked a smashed up, desolate waste; and I could not see any sign of life. I was quite pleased when we got to Lille, although Archie became decidedly more unpleasant, because at last I could see signs of life. I counted up the rolling stock in the station and sidings, made a note of engines and trains, and of motor-lorry and car traffic—knowing that *this* time I could not go round in a car afterwards and check it. Still, I thought, neither can anyone else.

After leaving Lens, we came back to Bethune, losing height all the way, and crossed the trenches at about 1,000 feet. At last I could see the lines, and even distinguish those of the Germans from our own, because Spratt flew along them for a minute or two. They looked ridiculously close together and at the same time ridiculously inadequate. Was *that* all that was reducing the war to static impotence? Yet when one noticed the two, or sometimes three, lines of support trenches, one thought again. We were being fired at pretty heavily by rifles and machine guns, and one or two bullets came through the planes. I happened to see one. It looked as though some invisible person had just stuck a big finger through the fabric. Spratt sheered off to our own side of the lines, and I thought it was quite time, too. I had not come to this war to get shot.

"Oh!" said the robbers dejectedly, "it is that someone has died in the house, and we do prepare the water, by boiling, to wash the corpse."

TALES FROM BAGHDAD

"Sightseeing is the art of disappointment."—R. L. S.

BY B. FITZ-JAMES HAYTHORNTHWAITE.

NEW and old, maimed and hale, East and West are all mingled in Baghdad to-day. Two hundred and seventy thousand souls or more, of whom three thousand are blind and maybe nine thousand more blind of one eye. Eighty-four departments; one highroad, hundreds of streets, perhaps half a dozen paved thoroughfares. Cinemas in houses of mud brick. Aye, and just before I left, that very film itself, "The Thief of Baghdad," was showing in the city.

From a train at home you can see near London, miles upon miles of residential streets, from the monotony of which the mind shrinks aghast. From the air in Baghdad, you can see great areas of honey-comb; square house sitting cheek by jowl with square house, so closely packed that only here and there thin lines indicate those gloomy, mud-paved gullies, which are the streets. Yet here the mind does not recoil. It is so strange, so torturous, so fantastic and so labyrinthine, that, save for the fear of getting utterly lost in the gloom, one can wander by the hour, without monotony.

Roughly the whole city fills the shape of a capital D, whose vertical is the river, and whose remaining curve is bounded by a broad topped bank of mud. In the heart of the city lie the bazaars, grouped together, a whole district in themselves, entirely differing in structure from the rest, completely set apart to commerce.

Round the bazaars is a mass of residential houses, intersected by

the straight gashes of New Street and its tributaries, and otherwise broken only by mosques and minarets.

The rectangular, three-storied, flat-roofed houses, innocent of windows on the ground floor, are usually built about a square courtyard. This may boast a shrub or two, or even a tree, and in the summer the best are provided with a double canvas awning, stretched over the whole courtyard at the height of the roof, as a shelter from the sun.

From the courtyard, instead of entering the ground floor of the house on each side, you may walk down four or five steps into the yet more delicious coolness of a Sirdarb, or by night climb upon the airy roof, to sleep under the dazzling jewels of heaven. The courtyard is generally paved with brick and slopes upon a small central hole into which drains everything from the house, and from which there arise some of the many composite smells familiar in the East.

Should the house have the misfortune to be below the flood level of the river, and close to it, in the floods this all-obliging hole is apt to be transformed into a fountain of incredible fœtor. Once a year, perhaps, the pit may be opened and emptied of its blackest slime, but the process is so very unpleasant that it is only carried out in the last resort.

All the streets are not span-wide gullies. In some, perhaps a dozen, a car can be driven, and, in a few of these, cars can even pass each other.

The City Sanitary Inspector is one of the few initiated Europeans, who knows what is interesting because it is peculiar to the city. He told me one day, as we passed the butcher's shop, on our rounds together, that some enthusiastic newcomer from England, in an official position, once actually had published the order that meat, before sale, was to be covered with cloth as a protection against flies; and that all meat was to be kept so covered until the moment of sale. Months afterwards, while he was on his rounds, he saw in the distance a certain butcher, whose wares were of course fully exposed and uncovered, heavily in the act of selling meat to an Indian customer.

The butcher was not, however, so absorbed as to fail to see the Inspector in the distance, whereupon, without a moment's hesitation, he snatched the turban off his customer's head, and, shaking it out, hastily draped his wares.

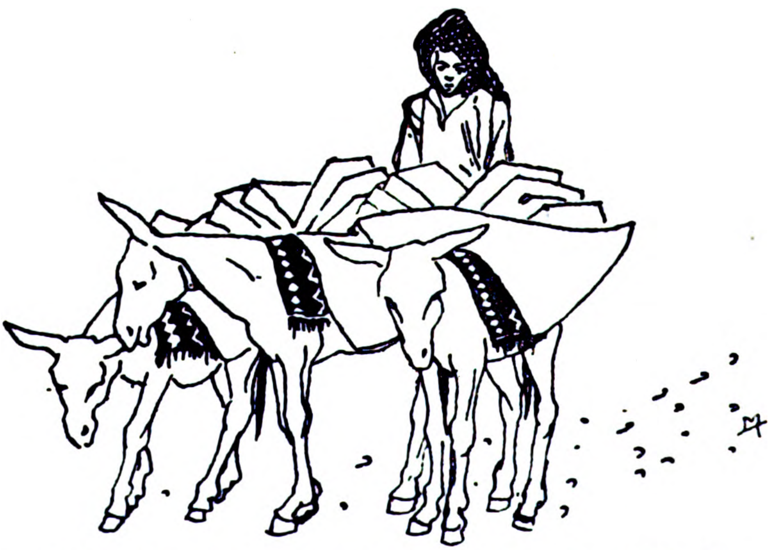
This alternative, possibly revolting to the inexperienced, was really preferable to the haze of flies surrounding a butcher's shop. Here, when the stock is low, there will be exposed for sale, not the juicy and familiar joints of home, but sundry scraps, black like swarms of bees, whose real nature is only revealed under a wave of the hand, when swarms rise in a buzz of annoyance. A blind man would have no

difficulty in saying when he was passing a butcher's shop. Not from the smell, but from the drone of the flies that hang in a faint haze about the shop front when business is active.

The European population lives, for the most part, in a separate and self-contained community; their knowledge of the city is superficial. The police officers are exceptions, and as is the way with those who know even a little of something of which everyone else is ignorant, they are apt to be saddled with almost miraculous omniscience, which I have often thought they must find embarrassing.

The tall, white donkeys of Baghdad stand out clearly as a feature of the city. A builder's boy drives 10 or 14 in a herd, each with his load of bricks slung upon his back, and the lad will perch himself right on the very kind quarters of the steadiest donkey, and therefrom, with shrill voice, send the herd down an alley at a merry trot. Arrived at the house, I have seen the donkeys, one by one, to slow up, and each, unbidden, turn into the courtyard through the open door (and even up the stairs, if they are wide enough) to the appointed place, with an intelligence which belies their name. Their white colour, I take it, is a matter of natural protection against the heat, in which this hardy species has survived. They have more than the heat to survive.

The society which exists in Great Britain for the prevention of cruelty to animals would find demand for its activities in Baghdad far more urgent than anywhere at home. I have seen, in the distance, what I was therefore impotent to correct and could not bear to see, but



The tall white donkeys of Baghdad stand out clearly as a feature of the city.

had to turn away, sickened with the cruelty. Indeed, the distribution of supply and demand in this world needs some adjustment. For here, at home, a rich and powerful society can flourish and carry its activities to the very extent of embarrassing the advance of knowledge, and yet somewhere else, only a week's journey distant, any man, enraged, can mutilate a dumb animal in the lust of cruelty, and there is none to say him nay.

When an Arab child begins his perilous journey into life, the ordinary dangers of childbirth are as nothing to those which the little mite encounters in the first two days of its separate existence. For within forty-eight hours of its arrival, tradition demands and custom exacts that it shall visit eight of the eighty-four cantonments; the explanation being, that the child, from its birth, must be introduced to the common smells or humours of the city. In this there is surely a parallel to vaccination! The infant, swathed in a bundle so tightly that you can hold one end and it will not bend, is conveyed in secret on its rounds, and at each appointed place rests a moment so that, through its tiny nostrils, it may sample the joys to come.

At one big gun in a public place there are certain traditional moves. The bundle, if he is a boy, is held vertically before the mouth of the cannon, so that he may have courage in the face of his enemies; he is passed into the very mouth of the gun so that he may remain steadfast under fire, and he is carried round it to acquire familiarity with warlike exercises.

When he returns home from his journey, his presence in the house is, for the first fortnight, attended by peril of peculiar character. He is subject to "influences," some good, some bad, but the worst of all influences is that of the unknown, and for this reason he is conducted round the house, and carefully introduced to each of its inmates, and everything that it contains.

And from that date, for a period of about a fortnight, no thing or person can enter without the permission or knowledge of his little majesty. The venerable coolie tottering beneath a load of sticks must wait without the courtyard until the infant is brought down to meet him, and, to welcome him, is passed three times about his person. The same applies to every article of household necessity, as well as to every visitor. Perhaps the tradition of hospitality, so marked in the nomads, entirely absent in the later life of the city dwellers, is represented in youth by this vestige of training.

The story is told of a husband who had returned from a journey to find himself a father, whose small son was still in his first fortnight of life and lord of the manor. Shortly after the father's return, the infant began to ail, and no cause could be discovered for his sickness, until, after an extensive search through his parent's baggage, there

was discovered the innocuous presence of a cake of Vinolia soap. I can see it passing from one brown hand to another, from one contemptuous nostril to the next, until this nauseating influence, malign and unknown, is, in disgust, flung from the window into the street. On this, of course, the child recovered.

Of the ritual antecedent to birth I could learn little, but the preparations are well known when it is expected that death will pay a visit to the house. The invalid is laid upon the oldest and most ricketty bedstead, and stripped of all but the least desirable of coverings. When he dies it is decreed that everything he is touching and the bedstead upon which he is lying shall be the perquisite of those who come to wash him and lay him out.

For this reason also, midwifery, with its attendant uncertainty, is inevitably fraught with difficulties. Often the mother-to-be is given the oldest bed in the house—not so much in any spirit of pessimism—and covered with the oldest clothes—again not so much to discourage her, as that the custom often exacts that bed and bedding are the perquisites of the midwife.

The conversation of a polite citizen of Baghdad is ornamented by a whole fringe of conventional repartee. It is no mere case of "How do you do?" and so to the heart of the business, and then "Good-bye"; certain questions must be asked and certain answers given before the pith of the matter can be broached; the most direct of polite speech is inelegant unless pointed by the implication or allegory of a familiar catch-word.

Each of these catch-words, or proverbs, has had its traditional origin. It is as though we British, knowing that "you can take a horse to the water but cannot make him drink," were also to know the precise circumstances in which this startling phenomenon was first discovered. For a Baghdaddi, conversation is full of proverbs which are bandied, not for what they say, so much as for the circumstances associated with their origin. To appreciate the one you have to know the other.

We British say incredulously, "Oh! Tell it to the Marines"; a Baghdaddi would murmer sadly, "*Try and persuade Haji Achmed Aga.*" To understand him fully we would have to remember that there was once a certain magistrate, by name Haji Achmed Aga, who was renowned for the severity of the beatings which he imposed upon those who were brought before him. There was also a certain widow in Baghdad, much neglected of her only son.

Now it is the law that an only son shall support and cherish his widowed mother. Often, suffering privation or cruelty at his hands, she was tempted to report him to Haji Achmed Aga. But as often, at the thought of this fierce magistrate, compassion for

her son would cause her to forgive him, and she would suffer in silence.

At last she could stand it no longer, and went to Haji Achmed Aga and told him how that her son not only had neglected her, but had starved her cruelly. On this Haji ordered: "*Go* and bring your son and I will show him how he should treat his widowed mother." And he sent two of the guard with her.

Now as they went from his presence into the crowded street, her heart smote her, and she remembered that her son was but a frail man, and would hardly survive the punishment undoubtedly in store for him. And as she went she thought she would choose someone better able than her son to bear the punishment. So she pointed to a sturdy Kurdish coolie, saying: "That is my son."

The guard fell upon the astonished Kurd and dragged him, protesting, before Haji Achmed Aga, to whom they said: "Not only does this wretch deny that he has ever neglected or starved his poor mother, but he actually denies that she *is* his mother."

Whereupon Haji ordered that he should receive a beating of unprecedented severity. And while he was yet lying upon the ground he bade him rise and carry his widowed mother out of the courtyard upon his back.

This feast of retribution was in fulfilment when the poor Kurd's brother, having heard of his arrest, came running into the courtyard, amazement in every line of his face. "Brother, brother," he cried, so that all were silenced, "Why do you do this? What is it that has happened to you?" "Ah! my brother," the poor Kurd answered, "I have been beaten for that I neglected and starved this woman that I bear upon my back. She is supposed to be our mother. . . . I have never seen her in my life before!"

"What! Did your tongue forsake you? Why did you not *tell* them that this woman is not our mother?"

"Ah!" said the poor

So she pointed to a sturdy Kurdish coolie, saying "That is my son."

Kurd, with a groan, and staggered as he spoke. " Tell them! . . . Tell them! . . . *Try and persuade Haji Achmed Aga!"*

We English might say that there is "no use in crying over spilt milk," but the citizen of Baghdad would know just how the milk was spilt; who wept; and who (with the tact of a near relation) proclaimed the weeping futile. In his own tongue a Baghdaddi would say, earnestly, "*There will be crying in the morning."*

For once a certain band of robbers, having broken into a house in Baghdad, and extracted considerable loot, contrived to escape without awakening the inmates. Hardly were they in the street—a blind alley—before they saw the lights of the Watch approaching. With great presence of mind they made as though to light a fire under a large copper cauldron, which was amongst the loot, and were thus engaged assiduously when the Watch arrived.

" Ho!" said the Watch, full of suspicion, " and what are you doing here?"

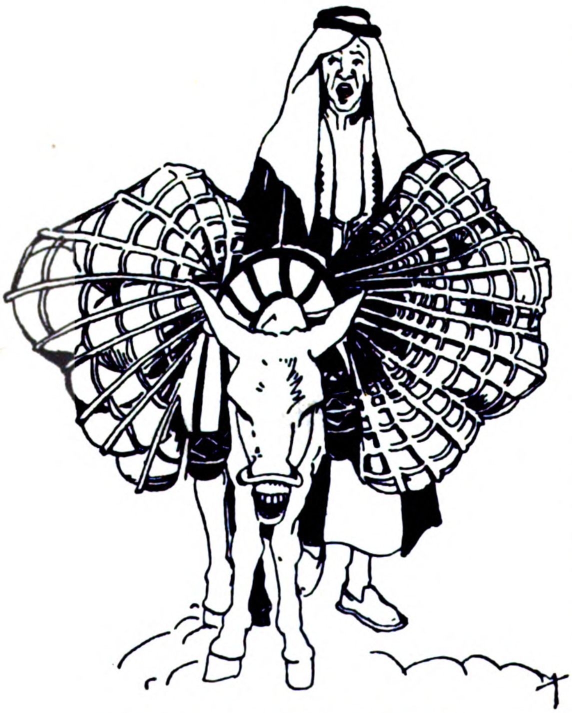
" Oh!" said the robbers, dejectedly, " it is that someone has died in the house and we do prepare the water, by boiling, to wash the corpse."

" Indeed!!" said the Watch. " Indeed!! And if someone has died in the house, then why is there no uproar and crying?"

" Not now, oh! not *now,"* said the robbers, earnestly, " *but there will be crying in the morning!"* At which the Watch, satisfied, passed upon their way, and the robbers made good their escape.

Towards dawn, the inmates of the house awoke, and, discovering their losses, created a lamentable uproar, to which the Watch, who were passing in a neighbouring street, gave no heed, but said among themselves, " They said truly: '*There will be crying in the morning.'"*

The tale is told of a poor potter from an outlying village, who once ventured into



"Come buy my pots, my beautiful pots."

the city to hawk his wares. They were hung in two gigantic nets on each side of his donkey, and as he went through the streets he cried aloud:—

"Come buy my pots, my beautiful pots.
Come buy, come buy, my beautiful pots."

Now whether it was that the ass was frightened by his master's cries and the unwonted echoes in the vaulted tunnel of the bazaar, or whether he spied a damsel donkey in the distance, it is left to speculation; but the fact remains that, no sooner did his master raise his voice to hawk his wares, than the donkey must throw up his head and bray (as is the way of donkeys) loud and long, to the astonishment and intense delight of the passers-by. At last the poor old potter, getting much the worst of each encounter, and disgusted by the laughter, became enraged with the ass, and turning upon him, cursed him, not merely for his ancestry and into remote generations yet to come, but also for his religion, crying out at the end: "*Either YOU or I.*"

And it is easy to see how, to this day, where two polite persons, engaged in conversation, should chance to speak simultaneously, he wins who stops first and says to the other: "Either you or I!"

There is the greatest gulf between the rascal dwelling in the city and the honest farmer of the fields. Every farmer, if he is a right-minded fellow, will despise the quick-witted, shifty and idle man of the town, and take any opportunity he can to show his dislike.

Now it happened that a certain farmer and his wife were reaping in a field, and a stranger from the city, who was passing by, chose to say one or two things unmistakably too personal to the wife, whereat the good farmer, outraged, fell upon him and thrashed him soundly.

Neighbours ran to gather round at the outcry, and to these, as soon as he could escape, the citizen protested: "I was but passing through the field, and took, on my way, only a handful of grain, and behold, this fellow beats me like a dog."

"Ho! Ho!" said the farmer, with added fury and gusto, "*Those that know, KNOW! Those that don't, think it was only a handful of grain!*", and he sprang upon him and thrashed him into the distance.

Thus, to this day, will one citizen, doubting the word of another, say, knowingly, "*Those that know, KNOW! Perhaps it was only a handful of grain!*"

There is another common example of this feeling between agriculturalist and townsman, in the familiar saying, "*Oh for an answer to that!*"

During a dust storm one day, while the date palms were tossing wildly in the wind and the whole air was full of the fog of fine dust,

in the relative obscurity a townsman thought to steal some of a farmer's turnips. He had already several in his basket, when the indignant farmer, who had been watching, crept up behind him and caught him stooping, his very hand on a turnip.

"Ah, ha!" said the farmer, delighted at his success, "what are you doing on my land?"

"Oh, this wind, this wind!" the townsman answered, with convincing pathos in his voice. "It blew me here off the road!"

"Indeed," said the farmer, visibly taken aback, "but then why have you your hand on my turnips?"

"The wind again!" cried the townsman. "Too easy, too easy! It is blowing so hard that I have to hold on to *something!*"

"I suppose so," rejoined the farmer, incensed at the other's ready tongue. "But why, by Allah, are my turnips in your basket? Tell me that if you can, you . . . ."

"Ever since I first saw you," the townsman sighed despondently, "I have been saying to myself, '*Oh for an answer to that.*'"

* * *

The bazaars lie centrally and have considerable frontage on the river; from the air they are unlike the honeycomb of square, flat-roofed, residential houses, and stand out as a solid mass of roofs, only broken here and there by a mosque or street.

Early in the morning the merchants will arrive, and great is the bustle as the padlocks are opened, the shutters taken down along the whole length of the street, and the wares set out for sale. Soon the roofed tunnel is transformed, and early wayfarers begin to pass. Rivals crouch behind their stalls almost elbow to elbow, and a

And caught him stooping, his very hand on a turnip.

customer who does not go the length of the street and back, in search of satisfaction, is a fool who is treated as such.

Each industry is grouped. There are notable exceptions, where successful merchants have turned whole houses into stores of every kind of ware, but these are mainly for the convenience of the opulent, and are not, properly speaking, the bazaars. Each group will flavour the street according to its wares. The leather folk thump and stitch in an atmosphere of tan; the carpet men are silent, save at the climax of a bargain; the copper-smiths create a deafening clamour and yet contrive to hear each other speak.

The tunnels of the bazaars cross at right angles, and lie, for the most part, parallel. Here and there they bound a big building, and you can dive in and down between stalls, through arched doorways, to find yourself in vast roofed courtyards four square to the street outside, havens of sudden silence and coolness.

In these roofed courtyards, the light filters down from above upon unopened bales stacked upon the ground in a wealth of profusion which fascinates the imagination. The cloistered verandah running all round the first floor looks down into this well. You may enter seemingly unobserved and silently down the earthen passage, yet at any moment if you stand and turn, as your eyes become accustomed to the gloom, you will find that someone is watching you, and presently will approach or call to you quietly to know your business.

In such secluded courtyards the wholesale merchandise is handled, and here merchants retire to squat around small rooms, on high uncomfortable benches, their feet caught up off the ground under them on a rail.

Here, after the floods, in which much merchandise was waterlogged and sodden, an acquaintance of mine was sold a bale of cotton cloth. It was, the seller declared, quite stained by the water, and so was sacrificed at a loss. Thus, the purchaser subsequently discovered, a wily merchant enormously increased his turnover. He cut enough out of each new bale, and then dipped them all in muddy water to swell, and give them weight and local colour. Finally he sold them as flood-damaged bargains and at a profit considerably above market price.

At the other extreme of noise is the copper bazaar, a sloping street, forked at its upper end, and so roofed throughout at each side that here the westering sun sends down shafts of light into the dusty uproar. And here that long-suffering metal, copper, is pounded, bent and battered, from heavy sheets into a great variety of articles.

Towards the upper end there are several real infernos. You can look down a few steps into a thumping and thundering darkness, while the crowd continue to jostle you from behind. As many as

eight swarthy demons may be gathered about one anvil, the whites of their eyes gleaming in the darkness. Upon the anvil a ninth will hold a stack of circular sheets, glowing from the furnace, upon which the others rain their blows.

The leader strikes on his appointed place. The team follow in turn around the circle. The rhythm of the crowded blows repeats itself with the slight irregularities of a peal of bells. All are intent with effort. The very earth shakes at your feet. Each, as he strikes, groans aloud for the strain, and at a shout all cease, while heavy breathing fills the gloom. And now the bellows reawaken, invisible in the deeper darkness, and about the furnace top green flames gather eagerly.

Or again, when the bases are hollow enough, they will be dovetailed edge to edge with the shapely tops, and braized together. Then, outside, they are bent, shaped and hammered by old and young, crowded side by side along the street. Here, though you may *see* cauldrons coming into shape and the ornamental edge growing around a beaten tray, yet you cannot hear yourself think. If there is a question of a purchase, at a word all of that stall will ease their hammering, and renew it again in a moment.

Each of the stalls is but a box, opened to face the street, wherein the keeper sits among his wares. In one such box I have been granted a corner by courtesy, from which to watch and listen. No beast bigger than a pack horse passed up or down through the throng of pedestrians, and this endless stream varied all day long. There were those who passed through, using the bazaar as a thoroughfare, with obviously no intention to purchase. Coolies laden with anything from a sack of grain to an entire steel joist, plodded by, without ever so much as lifting up their eyes to heaven, crying " Malek, Malek!" for gangway in the press.

In the Copper Bazaar. Each of the stalls is but a box opened to face the street, wherein the keeper sits among his wares

Arabs, Kurds, Persians,

Jews, Armenians, Indians, Turks, Syrians, with an occasional European, small wonder it was that the tongues were babel. Any Baghdaddi in business must have a fair knowledge of three languages —Arabic, Persian and Turkish. Most have, also, a smattering of Hindustani and English as well.

As the afternoon wore on, I became aware of what is ignored and of that which is watched by the vigilant spider of a shopkeeper. Comes there a white man down the street, pausing from shop to shop to pick up, finger, and return the copper ware, then there goes before him a sensible wave of expectation and each crouching spider bestirs himself a little from his brown study and becomes all eyes and vigilance. A purchase completed, each listening through the babel of sounds picks out something that signifies conclusion, and insensibly attention is relaxed.

The basket boys, eager to carry purchases, have among them their own precedence as they hang like sea birds around the purchaser. He who is biggest holds the field. Yet I have seen some daring urchin, younger by years, watching from a distance, then judge to a nicety the culmination of the purchase, and in that instant run in and secure the commission in his open basket.

Two groups of nomads came in for a great deal of attention. They were in from the deserts, to purchase new cooking pots, and they took the entire afternoon to effect the transaction. It is for them an undreamt stupidity rapidly to clinch an argument.

Countryfolk, their parched brown nostrils were plugged against the intolerable vapours of the town. And as I sat watching in my dark corner, I remember feeling a soreness from the dust in the back of my own throat, which well confirmed their caution.

In Baghdad, save for a very occasional European, you are struck by a sense of ugliness in the place for that you never see a woman's face. There are veils everywhere. What *may* be beauty is hidden; and what *is* bestiality (such as I have seldom seen in men's faces) goes uncovered and unashamed. There are faces of such utter depravity you could wish the light of human intelligence in them were quenched, and that they were but the faces of some strange animals in clothes.

But these nomads, hardy women, went unveiled, and scornful. Brown, wizened and shrill-voiced, they drove their way in a bunch so that all made space before them. Their men stalked contemptuously in the rear. From shop to shop, from one end of the street to the other and back again I cannot tell how often they swept, fingering, poising, questioning and babbling amongst themselves, hovering to and fro in indecision.

Amongst the shopkeepers in their wake there followed a wave of

comments, I doubt not of the most inflammatory and scandalous. It was their day in town for these rustics, but unlike our English country cousins-come-to-town, often diffident and ill at ease, these tribesmen and their women were aggressively contemptuous, aloof and proud in every gesture.

Ultimately towards sunset, at my stall, more often visited than the rest, they came to anchor, and squatting, a sudden silence fell while their selections were weighed, and all eyes were upon the scales. At this the men brought down their eyes, accustomed to distant horizons, to the near confines of the street and to the exchange of silver coins for copper pots.

Prices throughout the bazaars go up three hundred per cent. on the sight of a white man, and, knowing this, when I came myself to purchase some silks from which an abba should be built, I sought the help of an Armenian lady, renowned for her sense of values, but with whom I could converse only in French. With her, and her brother as escort, we went the rounds of the bazaars that dealt in silks. Everything that we wished to see was shown to us in every shop, and I played the part of a friend, interested in her transactions and tolerant of her indecision. From time to time she would pass me something to feel and I would turn it over with *one* finger. It would so happen that she would take no more interest in that article. Or I might lean across to touch what she was examining with *two* fingers, on which it happened she would ask to see something of a similar nature. Once, and only once, instead of two fingers I stretched out *three*, when the discussion as to price might perhaps have been noticed to receive closer attention than usual. Yet the article was returned and we continued our leisurely quest.

It so happened that some days later, passing that street, she allowed herself to be tempted into examining some silks again, and once more priced, this time at half the figure, since she was alone, that certain specimen of silk which I had touched with three fingers. A few days later it became her own at about a third of the original price, and is now an abba in my possession.

The bazaar of the red slippers slopes slightly to the river, and is a darker tunnel than most, that opens at its furthest end to broad daylight. Down each side are arches festooned and draped with scarlet slippers, as profuse as seaweed on a cave. In their abundance they make a curtain filling most of the entrance in many a stall, and so completely shutting out what little light there is that behind them you can see the cobbler doubled up and working by a candle. Half way down this street, on the left-hand side, one can enter through a bakery, a dim and lofty room containing the low white brick ovens, and with Persian inscriptions in relief, heavy with dust, high up on the back

wall, in which it is said (I do not know with how much truth) that J. E. Flecker derived his inspiration for "Hassan."

Yet everywhere is not devoted to native art. One hideous street is wholly given up to those creations associated with Birmingham. Brassy bedsteads, florid vases, cheap, tinny gramophones and painted mirrors will be watched over by some oily oriental in European clothes, with a leer so lewd and affable, that I wonder that he ever does any business. Or again, the half of the whole street will be given up to such curiosity shops as baffle all description. Here you will find, draped and piled and strung and laced, every conceivable form of unwanted tarnished, dusty metal work. Strings of soda-syphon-taps will hang between bunches of rusty keys and golf-club heads; battered old gramophone horns will be filled to overflowing with disused camera film reels, empty rifle cartridge-cases, penholders and padlocks. You wonder not so much that anyone ever wants to buy, as how the entire jumble can ever be compressed into one small stall, behind shutters for the night.

Vignette.

As the swift evening closes, the bazaars begin to empty, and by nightfall they are silent and dark. Only here and there, at the crossroads, a dim oil lamp flickers, showing blind shop fronts gauntly shuttered against thieves.

The vaulted roof blots out the stars, and turns each street into a gloomy and empty tunnel, paved with trodden clay. And when the eye looks in vain for the familiar throng, the ear strains to catch each sound, and imagination sees a robber lurking in each patch of impenetrable darkness.

Now and then the Watch, with slung rifles and lanterns swinging, come silently upon their rounds. They pass across a tunnel in the middle distance, and vanish.

Now and then from the few thoroughfares the thin blare of a klaxon leaks in to show that man is still awake. This ceases as the hours pass.

Nothing stirs in the still night air. No wind flaps the shutters. The significant silence picks out each muffled footfall for the roof to echo down the distant labyrinth.

Not even a dog howls. Baghdad is asleep.

MEMORIES OF WEI-HAI-WEI

By Wing-Commander C. E. Maude, R.A.F.

"Negotiations for the rendition of Wei-hai-wei were begun as a result of the offer to return it to China made at the Washington Conference in 1922, and after many interruptions owing to changes of Government and to civil war in China, have now, I am glad to say, reached a definite conclusion. . . . The territory will be restored in full sovereignty to China on October 1st next, the British garrison being withdrawn within one month from that date."—(*Mr. Henderson, in the House of Commons, May 5th,* 1930.)

* * *

To those who have never been there, Wei-hai-wei is probably little more than a romantic-sounding name which they associate vaguely with British interests somewhere in the North of China.

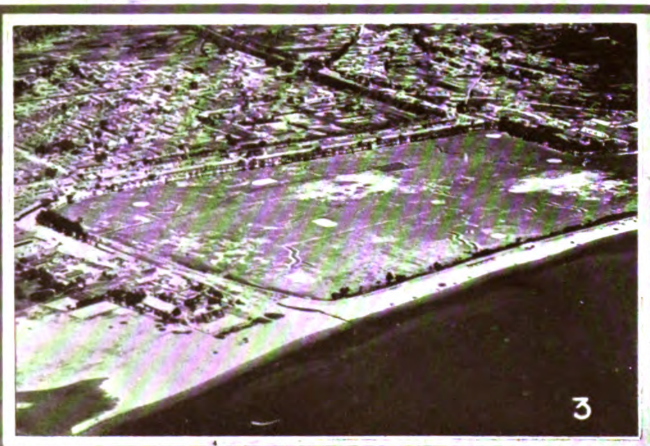
To those who know the place, what memories it evokes of happy summer days spent in its delightful surroundings, of bathing, picnics and tennis, sailing or shooting, or hot lazy evenings at the Club or one of the two hotels where so many of the British community would foregather for their summer holidays when they were able to get away from the heat of Hong-Kong, Shanghai, or elsewhere on the China coast.

In 1898, when the port and territory of Wei-hai-wei were first leased to Great Britain, Russia had occupied Port Arthur and was busily establishing herself in Manchuria, so that the need was felt for some advanced position for our Navy in those waters. (Wei-hai-wei is less than 100 miles by sea from Port Arthur, across the Gulf of Pe-chi-li.)

After the Russo-Japanese War, and the coming into force of the Anglo-Japanese Treaty, the situation was altered, and the strategic necessity for an advanced naval base no longer arose.

But the situation of Wei-hai-wei was very convenient for the peace needs of the Navy, especially in the summer months, providing as it did an excellent anchorage where ships could enjoy a change from the tropical heat of Hong-Kong, and could find sheltered and secluded waters to carry out their annual training exercises clear of normal shipping routes and without interfering with Chinese national interests.

So it was as a naval station that Wei-hai-wei was first established



1. **A BIRD'S-EYE VIEW OF THE ISLAND AT WEI-HAI-WEI. The Seaplane beach is at the far end, on the white stretch just beyond the pier.**
2. **422 FLIGHT AT WEI-HAI-WEI, AUGUST, 1927.**
3. **TWO SIDES OF THE WALLED CITY, WEI-HAI-WEI. Miniature golf links and recreation ground in foreground.**

and subsequently used; but the security and tranquility of the territory, which was early effected under British administration in striking contrast to most of the rest of China, soon established for it a reputation as a desirable summer resort, and for many years past it was used more and more for this purpose.

The leased territory of Wei-hai-wei consisted of the harbour and waters of the Bay, with the small island of Liu-kung-tao and an area on the mainland of the Shan Tung promontory of approximately 285 square miles.

The island was always predominantly naval in its interests, and beyond a hotel, where a good number of visitors and others were in residence in the summer, and a few native Chinese boatmen and shopkeepers, practically the whole of the works and resources of the island were given up to the Navy. A small dockyard and repair base was started originally, but had been little used of late years. Repair facilities practically no longer existed, but a stores depot had always been maintained, with a naval stores officer and small staff to supply the needs of the fleet on its periodical visits.

There was also a naval hospital and sanatorium which was chiefly used in summer, though it was kept open all the year. Here the Surgeon Commander in charge combined in himself the functions of P.M.O. and R.N.O. (Resident Naval Officer) and also, when the fleet was away, of Senior Naval Officer as well. He was, in fact, the king and governor and general factotum of the whole island.

On the island also was the Naval Club, an institution renowned throughout the China Squadron for its peace and comfort and general amenities; also officers' recreation grounds, tennis courts, a small but useful golf links, several excellent bathing beaches, and canteen and recreation grounds for the men.

A few official bungalows, including one appropriated for the use of the Commander-in-Chief when present with the fleet, completed the list of the island's resources.

Opposite the island, on the mainland, is the main town and port of the leased territory, Port Edward. Here was the seat of government of the leased territory, which rested in the hands of the British Commissioner, assisted by a small British garrison and an efficient body of local police or gendarmerie.

Here also the local merchants, bankers, and others were established, most of the leading business houses, banks, or shipping companies in China having their branches or agents here. A large hotel was established, and a good many small houses and bungalows for summer residents.

The town itself, practically all of which had grown up in the thirty years of British rule, had a well-kept and prosperous air which gave

satisfactory evidence of the good effects of a wise and efficient administration, and was indeed a true reflection of the general state of prosperity and tranquility of the territory as a whole, in striking contrast to the lawlessness and brigandage of the surrounding (Chinese) countryside. Local industry had grown and prospered, and more still would have been done were it not for the unsettled condition of China as a whole, and especially the uncertainty during the past few years regarding the future of the leased territory, which had retarded natural growth and prevented the influx of capital necessary for the full development of existing enterprise.

My visit to Wei-hai-wei was in the summer of 1927, when serving in the aircraft carrier *Argus*. We came up from Shanghai at the end of June, and it was the most welcome relief in the world to exchange the heat, the noise and the smells of overcrowded Shanghai (not to mention the somewhat hectic life that we led there) for the peace and quiet, and freshness of Wei-hai-wei.

In July the *Argus* had to go down to Hong-Kong for docking and refit, and some of her aircraft were landed to operate from a temporary shore-base while she was away.

So for the next six weeks I was ashore on the island, living a life of comparative ease and luxury at the Club, and enjoying a pleasant sense of freedom and relaxation after the trammels of ship life.

Various ships of the China Squadron were there to keep us company, but no one else was actually living ashore (except the P.M.O., his staff and patients at the hospital), so that one could not help experiencing a certain feeling of superiority over the less fortunate whose duties took them back to their floating steel cages every night. When I say that no one else lived ashore I am forgetting the many summer visitors at the hotel, most of whom were our very good friends and companions.

In the mornings, and occasionally in the afternoons, we flew as required by the fleet, and the rest of the day we were free to pursue our own occupations, to work or play, to rest or take exercise, as the spirit moved us.

The weather was very fine on the whole, hot but seldom unpleasantly so; usually about the equivalent of a really hot summer day at home. Once there was a heat wave (as we sometimes have at home) when the temperature worked up to between ninety and one hundred degrees for two or three days; but the average was round about seventy-five to eighty degrees, and very pleasant for those who love warm weather as I do.

Of course we were suitably clad for the weather, which one so seldom is at home. Our working dress consisted of shorts and a shirt, with occasionally a tunic if one wanted to be very respectable.

A steam ferry runs between the island and the mainland, and I took many opportunities of paying visits of exploration.

The fare in the ferry was 20 cents (nickel), and normally of course there would be 100 cents to the dollar ("dollar Mex" worth approximately 2s.). Actually, owing to the debasement of coinage in China, one could always get 120 cents (nickel) in change for a silver dollar. Therefore if one tendered a dollar in payment of the fare, one received one's ticket and 100 cents (nickel) in change, so that one felt one was travelling for almost nothing!

Close to the modern town of Port Edward is the ancient Chinese walled city, dating back to I know not when. In Shanghai in 1927 one was not allowed into the Chinese city, but in Wei-hai-wei there were no restrictions—in fact, visits were encouraged for the sake of trade—and certainly a visit, or more than one, was well worth while.

It is in very truth a walled city, in fact as well as in name: roughly rectangular in shape, it is sharply limited by its four battlemented walls, broad and high, with hardly a break in their surface all round their periphery. The only entrances are by four tunnels (with heavy portcullis-type gates) cut *under* the walls in the centre of each side. Going through one of these tunnels, one finds oneself in another world, a wonderful world which seems to have stood still for the last few centuries. Outside is the modern world, with more or less modern buildings, streets, shops, well-paved roads and all the appurtenances of modern business (so far as they are found in China).

Inside, one seems to have stepped back into the middle ages: narrow streets and alley-ways, with no road surface or paving; low-roofed houses, some hardly more than hovels, opening direct on to the roadways; and an open drain or gutter running down the centre of each "street" into which is thrown all the refuse, slops or swill from all the houses. No shops, but vendors of various wares and foodstuffs squatting in the roadway outside their houses, with all their goods spread out before them. Collections of children playing in the gutters, some of them surprisingly neat and tidy, others indescribably filthy. Various dogs of unknown breed snarling and prowling around. And over all (for this is summer time and hot) a swarm of flies, especially around the sellers of meat and sweets, of fish and vegetables. Of sanitation there appears to be none. One gasps for air in the close and fœtid atmosphere, and wonders how anyone can live in such conditions. But live they do, and some at least, from all outward appearances, seem to thrive on it.

As the plan of the city within its four walls is rectangular, so is the general lay-out inside, for there are two main "streets" running straight across from gateway to gateway and crossing at right angles

in the centre; and in each quadrant so formed there is a medley of courts, alley-ways and huddled houses.

Towards the boundaries, under the shadow of the walls, the buildings are less crowded, and here there seems to be more air and space altogether.

In this city, and in the modern town outside, several industries flourish, particularly pottery, silver work, and silk and linen embroidery, in which there is quite an export trade.

In the linen and silk embroidery trades the most beautiful work is done, the finest materials being used (including the best imported Irish linen) and made up into really lovely table-cloths, afternoon tea-cloths, luncheon and dinner sets, bed-spreads, etc.

I went over a linen and silk "factory" in one of the less crowded parts of the walled city, and although the conditions of labour are such as would not be tolerated for an instant at home—rows and rows of small girls of all ages from about six years upwards working elbow to elbow for all hours for ridiculous wages in small, ill-ventilated rooms—the work produced is certainly exquisite, and can be bought for about half the price one would pay at home for the same goods.

The territory as a whole is hilly and somewhat inhospitable, and from a distance the countryside looks bare and uncultivated. Much of it is, in fact, rocky and unfit for cultivation; but as one walks over it and looks into it, one finds that every available square yard is, in fact, intensely cultivated (mostly in small patches).

There are several notable temples in the territory, and one in particular is well worth a visit. This is known as the "Temple of the Winds," and is situated on the very summit of a high hill a few miles from the port and harbour of Wei-hai-wei.

In the side of the hill, just underneath the temple, is bored a tunnel or passage-way which goes right through to the other side of the hill. The story goes (although I will not vouch for its accuracy) that the monks who first built the temple—at what date I know not—were much bothered by high winds which continually interfered with their work of construction. At last, however, they had a brain-wave, and decided that if they were to bore a hole right through the hill underneath their temple the wind would pass harmlessly through this hole without upsetting their work. Whether their scheme was successful, history does not relate; but the tunnel is there to this day.

Wei-hai-wei is surely unique, or was up to the time I write, three years ago, in that it is entirely without motor cars, the importation and use of motors in the leased territory being forbidden by local ordinance. The Army had a few M.T. vehicles, and one or two officers received special permission to land cars from their ships; but otherwise, never a car was to be seen.

The decree was probably a wise one, because outside the actual town and approaches of Port Edward there are no roads, and the town itself is too small and too dusty to warrant or support the use of cars.

In the late summer and autumn some quite good rough shooting can be obtained in the surrounding country, particularly in the low-lying coastal districts. The best shooting was probably in a marshy tract bordering the coast about 15 miles from the harbour of Wei-hai-wei, and we had some good parties in this marsh, with varying success.

In the middle of September the *Argus* arrived back from Hong-Kong, and the flight was re-embarked.

Early in October we said good-bye to the primitive delights and solitude of Wei-hai-wei, and returned once more to the more sophisticated and cosmopolitan atmosphere of Shanghai.

It was beginning to get a bit chilly before we left; the early morning bathe was no longer a thing of cool refreshment, and a certain moral courage was demanded to face the rapidly lowering temperature of the sea. In the winter I believe the weather is very cold, with hard frosts and much snow, and already in October the cloudless skies of summer had given way to cold winds and driving mists and rain.

Yet in spite of the break in the weather, we were all very sorry to see the end of our happy and peaceful three months' visit; and I think one would have to go far before one could find a more favoured spot, whether for climate or for general amenities, in which to spend a peaceful summer than the island of Liu-kung-tao in the Bay of Wei-hai-wei.

And now that the territory is handed back to China and British control withdrawn, what will be the outcome for Wei-hai-wei?

"Restored in full sovereignity to China" is a high-sounding phrase, but where is the sovereign power of China to be found in the present state of chaos and conflicting parties in that distressful country?

It is satisfactory to note that in the convention for the return of the territory various provisions are made to safeguard, as far as possible, existing interests.

Thus it is provided that "Unless the National Government of China decide to close the port of Wei-hai-wei to foreign residents and trade with a view to utilizing it exclusively as a naval base" (which it is to be hoped will certainly not occur) "they will maintain it as an area of international residence and trade." And further, "Pending the general application of local self-government in China, the Chinese local authorities will ascertain the views of foreign residents at Wei-hai-wei in such municipal matters as may directly affect their

welfare and interests." And finally, " The Chinese Government will lend to His Majesty's Government, free of charge, as a sanatorium and summer resort for the use of His Majesty's Navy, a certain number of buildings and facilities on the island of Liu-kung-tao, in the Bay of Wei-hai-wei, for a period of ten years with the option of renewal on the same terms by agreement." (Summary of the Agreements signed between the Chinese Government and His Majesty's Minister in China, as reported in *The Times* of May 6th, 1930.)

With China in its present troubled state, one cannot but feel anxious as to the fate of any territory handed over to the mercy of Chinese faction; but with the safeguards now provided, and the will to see them effectively enforced, it is to be hoped that Wei-hai-wei may yet continue to prosper and flourish for many years to come.

A FLEET AIR ARM CAMEO

BY COMMANDER M. W. S. BOUCHER, D.S.O., R.N.

THE aircraft carrier was steaming fast towards the open sea. Although she was one of the smaller vessels of her kind her huge bulk contrasted strangely with the little destroyer which followed close on her quarter. On board the great vessel there was an air of efficiency and bustle. Aircraft were being prepared for flight, pilots and observers were getting into their flying clothing and being given last minute instructions.

"Knock off larking about in the hangar, or you won't have a flip at all," bawled an R.A.F. flight-sergeant to a large, free-and-easy able seaman, "Smiler" Yates by name. Smiler had been sent on board from the destroyer to be given a flight as a special concession.

"Here, get this on!" commanded the flight-sergeant, swinging a parachute and harness towards him.

Smiler stepped into the harness from several directions without success, and eventually found himself sitting on the deck completely tied up.

"Call yourself a 'handy man'?" scoffed the flight-sergeant. "Here, I'll show you," he added, adjusting the harness round Smiler's body and pointing out the ring to pull so as to operate the parachute, if necessary.

"Makes you feel like a 'ammick lashed up all ugly," chortled Smiler as he climbed to the flying-deck, where he had been told to wait. The harness and pack gave him a feeling of importance, and he was aglow with anticipation. The ship was steaming fast against a fresh breeze and the wind on the flying-deck made walking difficult.

"What are you lounging about there for?" demanded a voice.

He looked up and saw that the captain had addressed him from the open door of the chart house, a small moveable structure in the centre of the deck. He also observed that only men on duty stood about him.

"One of the Air Force sent me up 'ere, sir," replied Smiler, standing to attention and saluting cheerfully. "To wait for a aeroplane."

"Well, take this signal along,"—the captain extended a written sheet of paper—"and give it to that signalman at the after end of the flying-deck. Tell him to make it to the destroyer. Don't let it blow away. Put it in your pocket till you get there."

"Aye aye, sir," saluted Smiler. He had not noticed that there was a key in the chart house door which had caught in the ring for operating his parachute. As he turned smartly away to obey the order, a white object flew away in the wind.

"There goes some poor fish's 'andkerchief," he grinned to himself. "Wonder if it's the skipper's!"

Then things happened quickly. The ring of his parachute in which the key of the chart house door had caught had done its work, and the pack had snapped open. First had come out the pilot parachute which was the small white object he had seen, a second later it pulled out the main parachute and the wind filled this also. Smiler felt a violent jerk on his harness and was dragged fast along the deck by the wind, unable to stop himself.

" Hold that man!" shouted the captain, starting in pursuit.

Others sprang on to the flying-deck at his summons, and rushed to the rescue. With scampering footsteps the party, growing in numbers as it went, chased Smiler along the steel deck. The captain, who had got away first, now fell back. One man tripped on an obstruction and went sprawling, another caught Smiler's foot but could not hold it. The signalman, who was stationed aft, observed the wild scene and also ran forward to help. From his favourable position he had certainly the best chance of catching the runaway. He made a dive, but missed, and was only rewarded by a kick in the stomach. They were nearing the edge of the deck, below which the waves sparkled.

" Let him go!" panted the captain. " I don't want the lot of you overboard!"

Smiler scraped over the edge of the deck and took the air in grand style. At first he swung wildly, but soon steadied down. The life-buoy sentry, who was alone on the quarter-deck, waved his hand as Smiler swung towards him, and advised him to " 'ave a good time! " Looking back, Smiler saw the anxious faces of his would-be rescuers ranged in a row along the edge of the flying-deck. The wind carried him to one side, and a stifling breath of the carrier's smoke filled his lungs as the huge vessel left him.

" Blimey!" he exclaimed aloud, " 'Ere's a go. Reminds me of them dreams when I was a nipper. Wonder where I'll fetch up?"

The destroyer, well below the height of the flying-deck, was getting close and had altered course towards him. As she approached nearer she seemed to be rushing to meet him, and a moment later he was floating over her.

Then he felt a violent jerk which started him swinging again. He looked up and caught a glimpse of the mast, which had fouled his parachute. Next moment he struck something, and found himself clinging to the destroyer's bridge rails.

" Oh! It's you, is it? What the deuce d'you mean by coming here like this?" asked the captain of the destroyer.

Smiler recovered himself.

" I don't quite know how it 'appened, sir," he grinned. Then a bright idea came to him. " But the captain of the carrier told me to pass this signal to you, sir," he added, pulling out a crumpled sheet of signal pad from his pocket and handing it to the captain.

THE DAY OF GREEN BRANCHES

By an Exile in Mespot.

Basrah.

Why do we always stick greenery about the house when we feel particularly happy? The Day of Branches, coinciding as it does with our Palm Sunday, is a very happy day to the Jew boys and girls of the Middle East, who spend the whole of the day before stripping the nearest date palms of their leaves for its better observance.

Houses are decorated over the lintels with crossed branches torn from the date palms that surround the city, and grow for miles beside the Tigris. The dusty roads are strewn with them, motors are decorated with branches over the hood, boys and girls dash about in everyone's way armed with long branches called " Hosannas," which they use in much the same spirit as the weird toys popular on Hampstead Heath on any Bank Holiday.

After the siesta, the holiday mood urges each father of the house to take his family for an outing on the Tigris.

" By the waters of Babylon " in old days the Jews sat down and wept. To-day they feast and play by its creeks.

Basrah is the Venice of the East.

Instead of wonderful buildings of the past lining each canal, there are grey palms meeting high overhead, with cloistered trunks, going endlessly on both sides of Tigris and its manifold creeks. Strings of purple bougainvillea hang from the trees. It is the magic month of the blossoming of the rose and pink oleanders, as well as the date palms. The scent of orange blossom drenches the air beneath the groves where the graceful scarlet flowers of the pomegranate droop their waxen bells.

Heavily laden family bellums drift by, those pale blue gondolas of the East. Wreathed with garlands of oleanders round the high mooring posts fore and aft, with long streamers of flowers trailing in the water as the lithe Arab or negro poles them along, they are each packed with the overflowing quiver of the Jew.

Handsome young Jew boys in white silk gala suits, red-fezzed, with a tuft of oleander behind their ears, shout personalities happily to each other as the bellums draw close and pass.

Young Jew girls, proud in the exquisite beauty of their early teens,

peep under the corner of the metal veils. This square of black metal gauze, edged with gold, is the same material that meat safes are made of, and is worn in deference to the Arab custom. Old Jew women frankly turn it up from the face and front the world boldly, protected by their wrinkles, but the young Jew beauty uses the screen with as much coy allure as the Parisienne her veil.

Every Jew girl wears her hair in two long plaits, the end made fast with a bunch of gold trinkets. The gorgeous silk *ubi* they all wear, young and old, rival a parrot house for exotic colours. Flame, orange, rose, emerald, royal, purple, scarlet, sky blue and carnation, these marvellous cloaks are as heavily embroidered with gold as the family purse permits. Some cost £50 or £60 apiece, and weigh so heavily on the wearer's shoulders that only the consciousness of the wealth hinted at in its possession enables the girl to support it.

Pride is a great stiffener.

At dusk lanterns are hung on short poles fore and aft, and the crowded bellums zig-zag slowly on their course like fireflies, homing to the great feast that ends the day.

J. P.

ONE CROWDED HOUR

BY KENNETH QUINTREL.

EVEN in his dreams, Flying-Officer John Cornwall was in a bad temper, and with closed eyes and set lips flung himself angrily from side to side of his camp bed.

Yesterday had been his unlucky day. On the return from a long flight over enemy country, his engine had given trouble, and he had fallen behind the rest of the formation; whereupon the anti-aircraft gun by Punch's Wood had singled out the lame duck for concentrated hate.

Though quite close enough to put him in abject fear of a direct hit, the exploding shells only punctured the wings and tail-plane. But the strips of torn fabric flapping in the propeller blast had extended the damage; and, though the aeroplane would fly, it would not land without difficulty.

The resultant crash, not entirely his fault, followed upon several that were; indeed, as Crasher, he was known to every Squadron of the Expeditionary Force. The Squadron Commander had been displeased about this last accident, and had hinted that accidents were permissible when officers did appropriate damage to the enemy; but an officer who was more expensive to his own side than to the other was a bad bargain.

So, in his dreams, Crasher cursed himself for landing badly; his Commanding Officer for threatening to stop his leave to England; and the enemy gunner for tearing his tail-plane, and for making him grossly frightened. Yes, most of all, that infernally accurate anti-aircraft gunner by Punch's Wood.

As he slept, a great voice called insistently something of extreme importance; but Crasher did not quite take it in. Long afterwards the same voice echoed even more urgently down the empty corridors of absent personality, but Crasher slept on. With infinite pauses between the thunderous strokes, a great clock began to strike; returning to consciousness between two of the strokes, he bounded from his bed, fully awake, and in a furious temper. The tiny chime of his little carriage clock leisurely completed striking the hour of six.

Six o'clock, and he had been warned for the dawn patrol. His batman must have called him more than once, and had gone away. Outside the windows, black dark; no sound of other officers dressing in the long wooden hut; and, far off, the cough of a cold aero-engine being started. If he missed being on patrol, that settled his home leave, with the C.O. in his present frame of mind.

In the dim light of the one bulb, flickering to the beat of the little engine behind the Mess, he snatched at flying-boots and leather coat, and huddled them on over his pyjamas. Hot with anger against all creation, he grabbed goggles and flying-cap, and rushed along the dark passage to the outer door.

Outside, his feet splashed through pools of water as he ran. It must

have rained all night. A thin drizzle cooled his flushed face. Why, the clouds were sitting on top of the hangars. Who on earth expected a patrol to be possible in weather like this?

Before the long hangar, an aeroplane was standing with engine running. He had heard it popping and banging when it was cold, but now it was smooth and sweet. Rainbows surrounded the arc lamps; and in the dim light he could see that the aeroplane was his own.

The flight-sergeant turned at his running footsteps, and gazed at him in surprise before saluting.

"Good morning, sir."

"Morning, flight-sergeant. Have all the others gone?"

"Gone, sir? There's no flying this morning. I sent word to your batman ten minutes ago."

That's what it was. So he had only his own silly self to blame. But it was a great relief not to be late for patrol.

"Then what's my engine running for?"

"The whole flight were wheeled out for the patrol, sir, till the duty officer said that they could be put away again. Then we found that yours was bogged, as there had been so much rain; and I was running the engine to warm it up so that she could pull herself out."

Well, here he was, all dressed up, and no place to go. He climbed into the pilot's seat, prepared to open up the engine and taxi the aeroplane back into its shed. Two men stood by the wings; the engine roared; slowly, slowly, the wheels and tail-skid drew out of the mud; and at the instant that the machine would have bounded across the aerodrome and into the air, Crasher throttled back the engine to a quiet hum once more.

His eye caught the patches on the wings, covering the holes made by fragments of shell yesterday, and his mind returned with a snap to his obsession, the anti-aircraft gun.

"What did you have to do, flight-sergeant?"

"New undercarriage, sir, patches on the wings, and new tail fabric. We finished work before midnight."

Crasher's ears tingled, and he rubbed his sweating palms together. A bright idea dawned warmly upon him, filling all his being with its glow. He would go and interview that gun, more or less at ground-level. With clouds so low, flight at anything above two hundred feet would be impossible. Upon such a morning, he would catch them with sleep-filled eyes; and would frighten them, with luck, much more than they had frightened him.

He pulled on his flying-cap and goggles, and waggled his fingers into flying-gloves.

"Got any bombs, flight-sergeant?"

"Yes, sir."

"Put five fifty-pounders on my racks."

The flight-sergeant looked surprised, but trotted away to the hangar. In five minutes four bombs were clipped to the racks below the wings, and one below the fuselage.

Crasher settled his feet determinedly upon the rudder, and gripped the control column. The machine ploughed across the wet aerodrome like a flying boat, and came unstuck from the soggy ground only just in time to clear the boundary ditch. Two red lamps gleamed ahead, and he

banked violently to avoid one of the wireless masts. The undercarriage snapped the aerial, and the broken strands whipped the fuselage viciously. But he sighed with satisfaction to be off the ground in safety. Now he was in the air, he was quite happy till it came to landing again.

No compass was needed to guide him to the front. Flash of ranging gun, and rising and falling flares, showed the trench line twenty miles ahead. One mile in each half-minute, the straight road below him unrolled like a ribbon. Sometimes its flooded ditches joined hands across the battered surface. Above his head, the low ceiling of cloud fled past, as though he were flying close to the roof of a tunnel.

Shell holes began to spot the dark fields, and scarred the road. Broken trees and buildings flitted past beneath his wings. Empty trenches, full of water; the British trench line, with its thin line of khaki standing to before the dawn; and enemy trenches, crammed with men.

Crammed with men! An attack in preparation, and no aircraft to warn the defence. Crasher spun round, grabbed his notebook from the rack, and scribbled a swift message as he circled over British ground.

"*Enemy massing for attack opposite you. Warn guns and Division.*"

Down into the trench it went, wrapped round a wireless plummet. Crasher circled about until he saw the runner start along the trench with it, and shot off again over "No Man's Land" into enemy country.

The flash of a distant gun provided more food for thought. He flew towards it, dived on the battery like an angry hornet, buzzed round it, noting the piles of ammunition dangerously close to the guns. And every battery must be like this, stiff with ammunition, since an offensive had been planned. Five bombs were not much good; he chose the biggest pile, and neatly planted one bomb in its midst; then with screaming engine soared into the clouds to escape the blast of the explosion.

Behind him, an immense light blazed across the sky; the aeroplane shook as though struck by a blow from a giant fist; the clouds were rent into yellow wisps; and rolling thunders of sound drowned even the noise of his own engine, so that he wondered for an instant whether it were still running.

Bombing ammunition dumps was a job for the Squadron; he had an appointment with an anti-aircraft gun. The Squadron must be warned as quickly as possible. As he hurtled along the road to his own aerodrome, he thought out the best way of getting them up.

There was a way. He thundered over the roofs of the officers' quarters, and dropped another of his precious bombs right into the ditch beyond them. Its reverberating crash would not only waken them, but bounce them out of bed as well. As he turned away, he wrote a carefully worded message, and glided down almost to ground-level to deliver it.

His old friend Tubby was duty officer, and stood before the open doors of the hangar. Crasher flew so close to him that he could see the belt of his blue uniform, like a hoop around a barrel. He tossed him the note, watched him wave to show that he understood, saw him shout to the flight-sergeant to get all machines out, and commence to run to the Squadron Commander's quarters. That was his duty to the Squadron. Now for his appointment with the anti-aircraft gun.

He sang and shouted for joy, as for the third time that morning he flew along the road to the trenches. This time he could hear the

thunder of the guns as they covered the enemy trenches with a pall of smoke and flame. But for him, the gunners would all be asleep. The aeroplane rocked violently in the disturbed air as the front line shot past below his wheels.

A little town grew up out of the grey dawn. As the machine flashed across its roofs, Crasher glimpsed the town square, full of troops formed up on parade. Instantly he flung all his weight on his controls, and was back over the square almost before they had realized his presence. His bomb fell right in the centre, spilling the troops outwards as pond ripples from a stone. He flung his machine round, and hurried on his way.

A mile to the south, the plume of smoke from a railway train caught his eye. Drivers usually shut off steam when hostile aircraft were about, but at such low height he was invisible to them. He proceeded across country to look at the train; a troop train, too, not goods. Better not waste a bomb on it. He sprayed the carriages dispassionately with bullets, wasted a few shots on the engine boiler plates, and shot ahead again.

But why a train upon this line at all? he reflected. All the air photos showed the bridge broken down. In a minute, he was circling over it, amazed at the perfect camouflage. Aiming with the greatest care, he put a bomb exactly between the rails; a billow of black smoke slowly arose, bearing fragments of bridge, rails and sleepers. He had no time to wait and see what would happen when the train reached the gap.

Half-way back to the road a troop of cavalry scattered at his approach. He wasted no shots on them. Might hit the horses. They couldn't help the war, anyway.

On the road, a line of motor vehicles, hurrying up to the front; towing guns and limbers, too. No need for bullets here; Crasher dived ferociously upon the leading vehicle. The driver gave himself up for lost, and threw up his hands. The lorry ran with a mighty splash into the ditch, and overturned, the gun slewed upside down across the road. Crasher was a mile down the road before the last lorry had crashed into the piled-up tangle of guns, limbers and vehicles.

Punch's Wood lay ahead, a grey blot upon the sodden country. "Object of reconnaissance," quoted Crasher grimly to himself, adding, "to exterminate one ak-ak-gun. I'll show 'em." The dark trees sped past close to his wings, the sharp scent of the wet pines drowning even the burnt-castor smell of his hot engine. The wood ended; in a neat square clearing stood the gun, its long steel nose aimed at the weeping skies.

Crasher's swift glance took in the pile of ammunition, the low wooden hut for the officers, and tents with the dim shapes of men huddled beneath the dripping flaps. The gun first. He swung round and descended until his wheels seemed to brush the tops of the little trees, and saw his bomb land within a yard of the gun.

He circled the clearing again as the smoke drifted away. The gun lay on the ground, a yard of its long nose broken off. Men bounded from the tents, and dived like rabbits for the undergrowth. Crasher hastened their flight with a vicious spray of bullets, poured a hundred rounds into the wooden hut till it looked like a sieve, and was three hundred yards on the homeward road before the men had finished running.

Not straight home, though. To the south of Punch's Wood lay a desert, without troops, houses or trenches. It looked only a patch from two miles up, but Crasher was curious to see more of it. Across miles of open fields, separated from each other only by the flooded ditches, he boomed contentedly homewards, less than fifty feet from the ground.

Below him, a road; and, travelling in the same direction as himself, a big black limousine. Sheets of water flew from its wheels. Crasher estimated its speed with an expert eye while he considered what he would do with it.

Pity to spoil such a fine piece of machinery. But it was driven by an enemy, and perhaps occupied by an enemy General. He might be the General in charge of the offensive; or, better still, he might be fat. What a lark to make him dance!

The aeroplane descended upon the car from one side until the driver fell within the ring-sight of the guns. Already the car was swerving wildly from ditch to ditch. Crasher refrained from pressing the trigger, and soared up again into grey clouds.

When he turned again, the driver had increased speed considerably and was crouching over his wheel as though to make himself as small a mark as possible. Again the man crept into the ring-sight, and Crasher pressed the trigger momentarily. The driver crouched still lower over the wheel, the car slackened speed and inclined slightly to one side of the road. One pair of wheels touched the margin, mounted it, ran along it. The car declined into the ditch, fountains of mud spouting from its inner wheels, heeled over till one side touched the bank, and came to a stop. The driver slipped sideways down the seat, but made no other movement.

One door was now jammed against the side of the ditch. The other burst open, and Crasher's ideal of a fat General scrambled out, purple of face, helmet over one eye, kicking and cursing as he stuck in the door.

He shook both fists at Crasher, circling above him, consumed with mirth. Crasher thrust the nose of his machine down, and placed four shots into the ground at the feet of the irate General. That officer gave one despairing glance round the empty plain, rushed to the back of the car, and with shaking and straining burrowed beneath it into the slimy ditch.

Crasher made a few more circles, digesting this situation. The General would be late for his appointment, anyhow; but it would be as well to put the car out of action. He put a few shots into the roof, in the hope that one or two would penetrate as far as the General; and paid special attention to the bonnet and radiator. In the middle of this, the gun mechanism clacked once or twice, and stopped. No more ammunition.

Crasher looked at his compass, and set a straight course for home. If he did not get back quickly, there would be no breakfast left. Burning dumps to either side showed that the rest of the Squadron had accepted his joyous invitation to a little ground gunnery and low bombing. Selfish hounds, he reflected bitterly, bombing a few dumps and batteries close to the line, leaving him to deal with whole armies of infantry, brigades of guns, columns of transport, and one General. Still, he had been responsible for dishing the offensive.

The aerodrome came in sight. Now he had got to land; most of it like a swamp, too. This was where his front wheels would stick in

the mud, and the aeroplane would turn over on to its back, and he would break his silly neck.

He circled the aerodrome twice, looking for firm ground. Not much of it anywhere. He chose his line of approach, made a cautious descent, found he was too close to the hangars, pulled the nose up too far, and crashed in a little cloud of wreckage at the feet of the duty officer.

"Crasher, you are the limit!" ejaculated Tubby. "That's the third this month. I'll swear you're not worth your keep."

Crasher sat amidst the wreckage thinking. He was certain the Squadron Commander would overlook it this time, and he vowed to himself that he would take lessons in landing when he got home on leave.

He looked at the wrecked aeroplane, and two men repairing the wireless aerial; and struck a swift balance with the dished offensive, the burning dumps, the crashed convoy, broken gun, one railway accident, and one shop-soiled General.

"Not worth my keep?" He scrambled out of the crash, snatched off his flying-cap and wrung it out as he trotted towards the Mess. "Oh, yes, I am," he called back. "Pick up the pieces, Tubby, there's a good chap!"

From the Mess there came the sound of jubilation, as of twenty-three other young men who have successfully carried out much low bombing, and finished their day's work before seven in the morning. Crasher pushed open the door. The noise ceased for a moment, and then broke out again with redoubled vigour. Officers hammered the crockery, climbed upon chairs and shouted, stood on the table and danced. A shouting crowd surged towards Crasher, shook his hands four at a time, thumped him on the back, and drank his health variously in tea and coffee, whisky, white wine, and cider.

Above the din, the Mess clock struck seven.

ROYAL AIR FORCE

Personnel.

Flying Training.—Since June 1st, 1930, the following have completed courses at the Flying Training Units:—

Central Flying School.—Flying Instructors' Course: 19 officers, 2 airmen, 2 foreign officers.

No. 1 *Flying Training School.*—" Ab initio " Course: 23 officers, 9 airmen.

No. 2 *Flying Training School.*—" Ab initio " Course: 25 officers, 7 airmen.

No. 3 *Flying Training School.*—" Ab initio " Course: 2 officers.

No. 4 *Flying Training School.*—" Ab initio " Course: 11 officers, 21 airmen, 3 foreign officers.

R.A.F. College.—" Ab initio " Course: 21 cadets.

Air Exercises.

The Air Defence of Great Britain Exercises took place between August 12th and 15th. The object of these exercises was to train the staffs and units of Air Defence of Great Britain in the type of operations in which they might be engaged in a campaign overseas against a civilized enemy equipped with aircraft, as opposed to the very special problems of home defence which have formed the basis of the Air Exercises in past years.

Overseas Commands

INDIA.

Since the end of April six squadrons of the Royal Air Force have been actively employed on operations on the North-West Frontier of India. The country over which these operations have been carried out extends along the whole tribal territory from Waziristan to Malakand. In one part or another of this wide area, operations have been practically continuous since the end of April, during which period the Royal Air Force has been called upon to deal with hostile tribes and lashkars, whose activities, unless suppressed with despatch, would undoubtedly spread and cause a very serious situation.

During the period under review the climatic conditions have been very trying, as the operations have taken place during the height of the hot weather season.

The detailed account is not yet available of the various air operations which have taken place, but reports show clearly that air action has proved an effective deterrent and has so far played an important part in preventing more serious unrest from developing among the Frontier tribes.

Auxiliary Air Force and Cadre Squadrons

TRAINING.

The period June, July and August has naturally been one of great activity for the Cadre and Auxiliary Air Force Squadrons.

The Flying Times for this period were as follows:—

Squadron.	*June.*	*July*	*August.*
	hrs.	hrs.	hrs.
No. 501	75	140	186
No. 502	206	242	151
No. 503	136	264	166
No. 504	95	92	241
No. 600	168	125	372
No. 601	111	132	364
No. 602	208	351	34
No. 603	215	381	94
No. 604	119	168	229
No. 605	316	224	382
No. 608	8	11	21

No. 600 (County of London) Bomber Squadron, represented the Auxiliary Air Force in the R.A.F. Display on June 28th, 1930, carrying out air drill in squadron formation.

The standard of flying for the event was considered to be most satisfactory.

With the exception of Nos. 604 and 608 Squadrons, recently formed, all squadrons attended annual camps.

CADRE SQUADRONS.

During annual camps, Cadre Squadrons carried out as composite units, full training programmes based on the syllabus for Regular Squadrons. Both Regular and Special Reserve crews carried out bombing and gunnery classifications when practicable, and airmen personnel were given, either intensive instruction to enable them to muster to their trades, or in the case of trained men, various posts of responsibility in flights and specialist sections.

A.A.F. SQUADRONS.

Auxiliary Air Force Squadrons completed during their Annual Training those sections of the Lord Esher Trophy Competition which had not been completed before Camp.

The Lord Esher Trophy was awarded to No. 605 (County of Warwick) Bomber Squadron, who obtained 1,519 marks out of a possible 2,000 marks. The result of the competition, which aims at testing all the forms of flying and ground efficiency of a bomber squadron, indicates that a commendably high standard of all-round efficiency has been reached by the majority of A.A.F. units. This fact was borne out by the very satisfactory manner in which certain squadrons subsequently acquitted themselves in the A.D.G.B. Air Exercises.

Nos. 600, 601 and 605 Squadrons formed a Day Bomber Wing of the "Blue Force" during the Air Exercises.

Judged by the number of hours flying, duration of raids, accuracy of air pilotage and bombing, and maintenance of aircraft, the A.A.F. units were placed high in order of merit.

During three days' operations, a total of more than 430 hours was flown; two long raids on the same day were repeatedly carried out by each squadron. The refuelling and maintenance of aircraft necessitated working long hours far into the night. The demands were without exception most efficiently and cheerfully met by the N.C.Os. and airmen of the squadrons. The Air Officer Commanding, realizing that in many cases Auxiliary airmen were on their main holiday of the year, expressed his admiration for the strenuous and patriotic way in which it was spent.

Personnel.

(*a*) The following were the principal appointments to Commissions during the period under review:—

Squadron-Leader (Honorary Wing-Commander) A. S. W. Dore, to Command No. 604 (County of Middlesex) Bomber Squadron.

Squadron-Leader W. H. Davies, to Command No. 608 (North Riding) Bomber Squadron.

Squadron-Leader W. L. Runciman, to Command No. 607 (County of Durham) Bomber Squadron.

(*b*) A number of Auxiliary Air Force and Special Reserve officers were examined and satisfactorily passed the examination for the Flying Badge. Amongst those who carried out the necessary flying tests were:—

Squadron-Leader the Rt. Hon. F. E. Guest, C.B.E., D.S.O., Officer Commanding No. 600 (City of London) Bomber Squadron.

Squadron-Leader the Rt. Hon. Sir Philip A. D. G. Sassoon, Bart., G.B.E., C.M.G., M.P., Officer Commanding No. 601 (County of London) Bomber Squadron.

Cambridge University Air Squadron

The annual attachment of the Cambridge University Air Squadron took place at Old Sarum between June 15th and July 26th.

Seventy-three members in all attended in three fortnightly batches, and, in spite of a good deal of unfavourable weather, put in a lot of flying.

The aircraft used were eight Avros and four Bristol Fighters, with two Avros and one Bristol Fighter in reserve, and for the six weeks under review the flying hours in C.U.A.S. aircraft only were 1,428, of which 629 were solo. Altogether, sixty-nine members flew solo, thirty-one for the first time.

No fewer than twenty-seven stations and aerodromes were visited by air, and the following were visited by road:—

School of Balloon Training, Larkhill.
School of Artillery, Larkhill.
Royal Air Force, Gosport; and
Royal Air Force, Calshot.

Two members brought their private aeroplanes with them—a Coupe Moth and D.H.53—and one, Mr. G. P. Fairbairn, of Jesus College, earned the distinction of being the first undergraduate to take part in the King's Cup Race. He had not previously been over the course, and finished 53rd.

Oxford University Air Squadron

The fifth annual attachment of the Squadron took place at the R.A.F. Station, Manston, from June 22nd to August 2nd, 1930.

The establishment of aircraft was ten Lynx Avros and five Bristol Fighters.

Out of the seventy-five members, three were prevented at the last minute from coming to camp. Of these, one was detained in London, preparing to fly to Nyasaland to take up his appointment under the Colonial Office; the remaining two were detained by sickness at the last minute.

The amount of solo flying done was more than double that of 1929. Dual flying was slightly reduced in favour of solo flying, and the "other flying" (mainly air pilotage passenger flights) has practically disappeared, since members are now able to teach themselves air pilotage while flying solo.

From the solo figures it will be seen that, whereas two years ago it was thought creditable for a member to go solo at his first attachment, it is now normal for a member at his first attachment not only to go solo, but to complete over three hours' solo flying.

Only two members failed to go solo. Of these one was found to have faulty eye-muscle balance and his flying in the Squadron has been discontinued, while the other only joined the Squadron a few days before camp began.

Of the twenty-six members who flew over three hours' solo at their

first attachment, nine had been in the Squadron for less than six weeks, and three of these had never been up in the air until they arrived at Manston.

A number of aerodromes were visited by members on cross-country flights and there were no forced landings or instances of members losing themselves on these flights. No damage of any kind was caused through lack of skill in flying or landing.

On the Monday of the second week of each fortnight the Squadron visited Felixstowe and Martlesham Heath.

Two flying boats from Felixstowe alighted off Margate pier and took thirteen members and one instructor to Felixstowe, where the morning was spent going round the station. In the meantime, the other half of the Squadron flew to Martlesham in O.U.A.S. aircraft and spent the morning there.

After lunch the two parties changed places by road transport, were shown round the other station, and returned to Manston again by air. Each member thus made a round trip and each had the experience of a flight in a flying boat.

Summary of Results.

(*a*) Out of seventy-two members, seventy went solo and sixty-eight completed over three hours' solo.

(*b*) Twenty-eight members went solo at their first camp (including three who had never been in the air until they arrived at Manston), and of these twenty-six did over three hours' solo flying.

(*c*) Twelve members qualified for the Squadron Certificate of Proficiency.

(*d*) In a total of 1,292 hours' flying by members, the aircraft were maintained at 100 per cent. serviceability, with the exception of one Avro blown over while taxi-ing.

Foreign Countries

FRANCE.

French Air Force Organization Law.

The Projet de Loi submitted by the French Government to the Chamber of Deputies has now been examined by a Commission appointed by the Chamber. After an exhaustive examination of the situation of France from the air point of view and an examination of the air organization of the more important air powers, the Commission recommends numerous modifications to the Projet de Loi put forward by the Government. The more important modifications are as follows:—

(*a*) Article 5 now reads:—

"The Air Forces are organized so as to provide:—

"(i) An independent formation known as the 'Reserve Generale d'Aeronautique.'

"(ii) Air formations for co-operation with the Army.

"(iii) Air formations for co-operation with the Navy.

"(iv) Air formations stationed in the Colonies."

The Commission adds the following note:—

"In reversing the order in which the various elements forming the Air Forces are mentioned, the Commission intends to draw attention to the importance which it attaches to the creation of a powerful independent Air Force. It will be noticed that the term 'Reserve Generale d'Aeronautique' has been used to replace the term 'Reserve Generale d'Aviation.' The new term includes balloons and lighter-than-air craft."

(*b*) As originally drawn up by the Government, Article 6 placed the Air Forces detailed for co-operation with the Army and Navy permanently at the disposal of those services for tactical training and training in liaison with the service concerned. The Commission proposed to amend the article in such a way that the Air Forces detailed for co-operation with the Army or the Navy are placed at the disposal of those services only for exercises and instructional manœuvres carried out in actual co-operation with the Army or the Navy.

(*c*) The original proposal of the Government for the division of France into air zones proposed to make the air zones conform to the grouping of the Army or Navy zones. It is now proposed that the air zones shall be organized without regard either to Army or Navy zones.

(*d*) Article 31 is modified to bring the Fleet Air Arm technically more under the control of the Air Ministry. The Commission adds a note that the maintenance of the absolute independence of the Air Forces embarked in ships would be contrary to the principles which have governed the creation of an Air Ministry.

The result of the modifications by the Commission will be to make the Air Ministry much more independent of the Army and the Navy than would have been the case if the proposals of the Government had been passed unmodified. There seems little reason to suppose that the proposals of the Chamber Commission may be rejected by the Chamber of Deputies when the Projet de Loi comes up for discussion.

Air Manœuvres at Lyons.

Air exercises were carried out over Lyons on July 29th for the purpose of testing the possible means of defence of the city against attack by aircraft armed with incendiary and gas bombs.

The first part of the exercise was carried out in the afternoon. The enemy, represented by Fighter and Bombing Squadrons of the 35th Aviation Regiment, coming from Grenoble, attacked on several sides in successive waves at an average altitude of 4,000 and 5,000 feet. They were quickly located by sound, and as soon as they were seen the A.A. batteries opened up a barrage.

The night attack was carried out by separate units, some coming from Grand Camp, others from Amberieu. Both civil and military elements had been co-ordinated for the defence. Between 2200 and 2300 hours the town was plunged in partial darkness and the fire brigades were called out to extinguish imaginary fires, while in the western quarters of the town, measures for protecting the population were carried out with the assistance of the police. At the same time the alarm was given to the batteries of the inner forts. Sixteen aircraft were signalled by the

look-out stations; others which arrived much later flying at an altitude of over 10,000 feet were not located. Searchlights were used successfully.

At the conference held after the exercise, the following conclusions were reached:—

(1) That the A.A. defence at Lyons as at present organized is inadequate to protect the town against mass air attack.

(2) That in the event of attack, the bulk of the population must be evacuated.

(3) That gas masks, and possibly gas-proof clothing, can only be issued to those who are obliged to remain in the town.

ITALY.

Experimental Types of Aircraft and Engines.

The Fiat firm have succeeded in producing a heavy-oil engine for use in aircraft, which has so far given excellent results in service. Several fairly long flights have been made, including one from Turin to Rome on the occasion of the Italian Air Display in June.

A new helicopter designed by Signor D'Ascanio was also on view at the Display, and made a short flight. This helicopter can leave the ground vertically without any run, and in the event of engine failure can descend perpendicularly, and is fitted with three propellers enabling it to fly in any direction. It is believed that all flights made to date have been of brief duration, and the helicopter is still decidedly in the experimental stage.

JAPAN.

As a result of the London Naval Conference, Japanese Press reports state that the Chief of Staff is considering the establishment of 13 new Naval Air Squadrons, which will bring the total up to 30.

At the same time consideration is being given to the provision of an additional aircraft carrier.

Admiral Kanji Kato, the former Chief of the Naval Staff, prior to relinquishing his post in June, 1930, is reported to have advocated the creation of 20 new Air Squadrons, whilst the Japanese Government are now credited with the appointment of a Commission to consider the eventual expenditure of £20,000,000 on 16 new squadrons, and provision for 100 seaplanes for use on warships.

CIVIL AVIATION

U.S.S.R.

With the exception of the Moscow-Berlin and Leningrad-Berlin routes, which are operated by the German-Russian Company Deruluft, all air routes in the U.S.S.R. are now operated by the state-controlled air traffic Company Dobroliot. Before 1925, a number of small companies existed in various parts of the U.S.S.R. As civil aviation became more organized, all the smaller companies either went out of business or became absorbed into the two largest companies, Dobroliot and Ukrvozdukhput. Since 1925, these two companies, together with Deruluft (mentioned above), have been the only air traffic companies in the U.S.S.R. The recent merging of Ukrvozdukhput into Dobroliot, together with a recent reorganization of the Soviet Government Department which controls civil aviation, afford evidence that the value of organized air routes in a vast country like Russia, with its poor land communications, is fully recognized.

UNITED STATES OF AMERICA.

Comparing the figures for civil aircraft, it is apparent that a drastic cut has been effected in the production programme for 1930; at the close of the year 1929 American aircraft manufacturers found themselves with large stocks of aircraft on their hands, due to over-production.

Beyond reducing their output, the Americans are endeavouring to penetrate into overseas markets as a means of selling their aircraft. An instance of this is to be found in the mission which the Curtiss-Wright Corporation—one of the largest American aviation groups—has recently been conducting in Europe.

Towards the end of April last, four Curtiss aircraft—a single-seater fighter, an observation aircraft, a training aircraft, and a civil cabin monoplane—commenced a tour of the less important European States. The circus was landed in Greece, and flew via the Balkan States, Turkey, Hungary, Austria, Switzerland and the Baltic States, to Scandinavia, where the tour ended. A display was given in each of the countries visited, and, it is stated, the aircraft were quoted on very advantageous terms. It is not known whether the mission was successful or not.

New York—Los Angeles Flight.

Captain Frank Hawks, on August 6th, 1930, completed a very fast flight in one day between New York and Los Angeles, a distance of approximately 2,800 miles. His total time for the flight was 14 hours 54 minutes. He landed five times *en route for* re-fuelling, and his actual flying time over the distance was 13 hours 38 minutes, his speed being slightly over 200 m.p.h.

The previous best over this route was 18 hours 46 minutes.

AIRSHIP NOTES

GREAT BRITAIN.

R.100.

In accordance with a request received from the Canadian Government, the flight of R.100 to Canada was postponed until after the Canadian elections had taken place.

The Atlantic flight, which was preceded by a satisfactory trial flight of 24 hours' duration, during which experimental W/T work and navigation practice were carried out, commenced on Tuesday, July 29th, 1930. The airship left the mooring tower at Cardington at 3.48 a.m. with 44 persons on board, and also carrying 10,440 gallons of fuel and 5.4 tons of ballast. Apart from a violent thunderstorm encountered 40 miles north-east of Quebec, when the fabric covering the starboard fin was torn, the flight was without incident. The airship's total time for the outgoing flight was 79 hours, of which eight hours were spent in cruising at a very much reduced speed in order that a temporary repair could be made to the fabric.

On August 10th, 1930. R.100 made a flight in Canada of 25½ hours' duration. when the airship passed over Ottawa, Toronto, Hamilton, Niagara Falls, Lake Ontario and Kingston. Just prior to mooring at St. Hubert the reduction gear of one of the engines was damaged, but in order not to postpone the date of the return flight, it was decided that R.100 should return to Cardington using five instead of six engines.

The return flight commenced at 2.38 a.m. on August 14th, 1930, and occupied a period of 57½ hours from the time of slipping from the mooring tower at St. Hubert to the actual mooring at Cardington.

The airship carried 56 persons on this flight, including 13 passengers, nine of whom were British and Canadian Press representatives. There were also carried 9,585 gallons of fuel, 6.3 tons of ballast and 1.5 tons of drinking water. The R.100 has up to date flown 296 hours.

R.101.

The insertion of the extra bay to R.101 is proceeding satisfactorily, and should be finished towards the end of September, and after a trial flight has taken place the intention is that the airship shall go to India. It is also hoped that one reversing Tornado engine will be available, in order that the R.101 may have five engines going ahead, instead of four as has been the case hitherto.

A MIXED GRILL FROM THE STATES

BY CYRIL THRIPP.

II.

THE article under the above title which appeared in the last QUARTERLY has engendered the slight suspicion in the mind of my American friend that he has not yet convinced me of the superiority of his country's aircraft. My comments have left him wondering vaguely, as he puts it, whether I am " high-hatting " him.

To remedy this he now proposes sending me literature dealing with the technical and more serious aspects of United States flying.

AIRCRAFT CARRIERS.

The first of these is a monthly magazine entitled *Aeronautics*, which has for its motto, " Simple duty hath no place for fear." He has used the blue pencil freely on the first page, so that we shall not miss an editorial headed " Scrapping $80,000,000? " This is a discussion on the London Naval Conference, and informs us, amongst other things, that:—

> " England wants us to reduce the maximum tonnage on aircraft carriers to 25,000-tons. The American newspapers gave us this information with little comment—possibly because the effect of this limitation was not indicated. The Naval officers have refrained from comment, due perhaps to the effectual gag control coming under the classification of insubordination.
>
> " England seems to have a rather persuasive effect on our students of diplomacy. . . . It so happens that America has only three airplane carriers—the *Lexington*, *Saratoga*, and *Langley*. The *Langley* is definitely regarded as being obsolete and of little value —the other two are the pride of the Navy. But the other two—each costing $40,000,000, weigh 33,000 tons each! It reminds us of the nursery rhyme ending, ' Wasn't that a dainty dish to set before the King? ' "

Further paragraphs in the same strain follow this, and the editor then refers his readers to an article on another page by Lieutenant-Commander Stevens, U.S.N., who is described as a " responsible officer in charge of airplane carriers." It is not stated whether this officer is subject to " the effectual gag control " previously mentioned.

Turning to Lieutenant-Commander Stevens's article, which is under the title of " In Defense of Airplane Carriers," we find it contains a description of the American carriers and some comparisons with British types. We are informed that " The British airplane carrier *Furious* has a flight deck nearly as long as that of the *Saratoga* or *Lexington*. but has engines of only 90,000 horse-power, half the power of the *Lexington*. . . ." Then follows some discussion of aircraft carrier design and details of the measurements of the *Langley*, with which we are not greatly concerned, having been informed previously that this ship is obsolete. The writer also discusses the possibilities of carriers of

lower speed and less tonnage than the *Lexington*, but he is not in favour of this proposal. He emphasizes the necessity of high speed, in the following words:—

> "It is imperative that a carrier be designed for as much speed as can possibly be crowded into her and still leave her big enough to house her airplanes. . . .
>
> "The *Lexington* and *Saratoga* in little more than two days out of New York can put airplanes that exist to-day, military airplanes capable of carrying out their deadly mission over Europe. And it took the *Bremen*, which is not a warship, four days seventeen hours and forty-two minutes to set the record for crossing the Atlantic, and it takes specially equipped commercial airplanes a day and a half to cross and arrive there spent after a hazardous voyage. Lack of speed when away from the shelter of a powerful fleet contains all the seeds of tragedy."

To illustrate this last statement, the writer gives the following "graphic description":—

> "On November the first, 1914, a group of British cruisers met the *Scharnhorst*, *Gneisenau*, *Leipzig* and *Dresden* off Coronel, near the savage and desolate coast of southern Chile. The Germans were superior in speed, and able to choose whether they would fight or not, and if so, when and from what direction they would engage the *Good Hope* and the three other British cruisers that opposed them. A dim, lowering day drew to a murky and indistinct close. In the last few moments of gloomy light, the sun broke through the low clouds of the western sea horizon with a blood-streaked lurid sombreness. The German ships lay to the eastward, where night had already fallen. The British spotters and gunlayers had only ghostly wavering flashes for a target, while the English ships were clearly silhouetted against the sinister light. By the time the last light faded, the sea was strewn with English wreckage. The *Good Hope* and the *Monmouth*, completely annihilated, rested on the bottom ooze of the southern Pacific, while the ship's surgeons of the German squadron were late to dinner in the wardrooms only because of bandaging three men slightly wounded by flying fragments."

The writer concludes with an appeal for the retention of the bigger carriers:—

> "The *Lexington* and *Saratoga* cost only a little more than a thousand dollars a ton. This compares with the cost per ton of the average automobile, and the average American family has a new automobile every three or four years.
>
> "They are the only ships we have that possess a clear-cut and distinct superiority over ships of other nations. If we must retain warships, let us keep good ones."

Steam Aero Engines.

Our "blue-penciller" is apparently not an enthusiast for unconventional ideas, for he has ignored an article in the same magazine entitled "Steam Engines for Airplanes?" This advances several theories which are worthy of investigation, although the author, John B. Rathbun, is

far from dogmatic. He at first refers to the present time as "an age of standardized thought," and suggests that we are inclined to accept the internal-combustion engine for aircraft as finality.

> "It has been the traditional belief that the internal combustion engine is the only type of light aviation engine that can be constructed. This is not true. The idea has also been fostered that the gasoline engine is the most economical type produced. This is not true. In short, after going through a multitude of similar comparative items we shall find that the operating cycle of the internal combustion engine is quite a long way from the ultimate solution of the requirements of the ideal airplane power plant. . . . In past years when experimentation and development were at their height, and mostly before a practical flying plane was actually flown, more concentrated attention was given to the power plant in the vague hope that a sufficiency of power would overcome the aerodynamic difficulties of that time. It was during this era that the steam engine or external combustion engine received a considerable amount of attention because of its well-known ability as a power unit, and some success was attained by such investigators as Ader and Maxim before the Wright brothers' first flight. It was not because the steam engine proved impracticable at this time, but largely for the reason that its prominence was then overshadowed by the more intensive development of the automobile as is now the case, and the fact that the Wrights were successful with gasoline engine propulsion."

The writer continues with a detailed history of aero engines, and then discusses the steam engine and its advantages and drawbacks from an aeronautical viewpoint:—

> "One of the outstanding characteristics of the steam engine is its tremendous torque or turning effort extended throughout a greater portion of the stroke, and its greater power reserve capacity. The power output of an internal combustion engine cylinder is limited by the amount of combustible mixture that can be drawn into the cylinder and by the amount of compression that can be employed without detonation, but the output of the steam engine cylinder is limited only by the boiler pressure, which, in practice, can range from 100 to 2,500 pounds per square inch. Further, the maximum combustion pressure in the gasoline engine is only momentary through an exceedingly small portion of the stroke when so desired. This means a far greater output per cubic inch of displacement with the steam engine, or, in other words, a much smaller engine for a given output. . . . The operation of a gasoline engine is attended by a series of hammerlike impulses that are more effective in creating heavy stresses in the materials than for the production of power. On the contrary, the full boiler pressure exists on the steam engine piston for a considerable portion of the revolution. . . . Propeller flutter and propeller stresses are thus much reduced by the continuous application of power instead of the present intermittent hammering."

He goes on to discuss the torque characteristics of the steam engine and suggests that the running of an eight-cylinder petrol engine is less

smooth than that of a two-cylinder steam engine. This indicates the possibilities of structural lightness in the steam plant.

It is interesting to note that:—

> "Even in the early days of Maxim, and only using 320 pounds pressure, the steam engine was brought below one pound per horse-power, while the combined weight of the engine and the very crude boiler was in the neighbourhood of 8 pounds per horse-power."

The writer denies the generally accepted principle that the steam engine is heavy on fuel, and states:—

> "In respect to the total cost of operation it need only be said that the steam engine can be operated successfully with any fuel from gasoline to shavings, while the internal combustion engine must be supplied with the most carefully prepared fuels to attain any degree of success."

After much weighty argument he sums up the main advantages of the steam engine as follows:—

> "(*a*) Greater reserve power for meeting emergency overloads with less liability of stalling the ship.
>
> "(*b*) The possibility of using lower grade fuels in the burners not only reduces the cost of operation, but also greatly reduces the liability of fire.
>
> "(*c*) Greater reliability in flight without dependence on tricky electrical systems.
>
> "(*d*) Better economy at low speed and cruising speeds.
>
> "(*e*) Instant reversal of engine possible for checking ground speed.
>
> "(*f*) Reduced propeller stress and more efficient propeller performance.
>
> "(*g*) Steam engine is self-starting under overload, thus making the dangerous practice of idling the engine unnecessary."

Altogether, it is a very interesting subject, although—in the author's own words—it is evident that "all of this will require extensive experimental work, but in view of the manifold advantages of the steam engine the game is well worth the candle."

Training of Pilots.

The next periodical forwarded for our observation is a monthly entitled *U.S. Air Services*, and the heading of the title page at once attracts one's attention:—

> "Of aircraft Rudyard Kipling wrote: 'We are at the opening verse of the opening chapter of endless possibilities.' The purpose of this publication is to provide inspiring and truthful pages for that 'chapter of endless possibilities.' This magazine is devoted to air development in the United States, birthplace of the flying machine, home of Wilbur and Orville Wright, who wrote the first flawless line of that opening verse, and through whose genius the world was taught to fly."

This lengthy sub-title is immediately followed by an interesting editorial article on co-operation of civil and service aviation in training

methods, under the heading "The Air Corps is Different." The following is an extract:—

"Regarding the future of aeronautical education in this country . . . the need was certain to be seen and met by existing air transport companies, and the final result would be the crumbling of the monopoly in flying training . . . held by the Army Air Corps. The announcement was made by one of the largest air transport companies in the United States that it was about to launch a school for the training of pilots and mechanics which would include a curriculum more thorough and exacting than that offered by any school, military or private, which had ever existed. . . . This school has carried out its plan . . . and the class of students attracted gives fine promise.

"Recently another item has come to light in the decision of the Army Air Corps to give this new type of civil training official recognition and official test. An invitation has been extended to certain carefully selected civilian air schools to furnish candidates from amongst their graduates for the Army's advanced training course at Kelly Field. The Army in this takes notice of the excellence of the training offered by these schools, and the inference is that if students picked from their graduating classes prove to have the requisite qualifications the Air Corps will be relieved of a large burden of cadet education."

Low Flying.

This "grill" would not be complete without some extract culled from that voluminous magazine *Aviation*, which claims to be the oldest American aeronautical publication. Invariably the most interesting article in this periodical is that written by the Managing Editor (R. Sidney Bowen) under the title of "The Trends of Activity," and in this instance he deals with low-flying which has been the subject of litigation in the United States:—

"A review of legal and governmental matters brings to light some interesting decisions and development trends.

"For many years owners of property adjacent to flying fields have battled in the courts for the award to them of damages against the flying field owners because of planes flying too low. The case of Fred L. Swetland and Raymond H. Swetland against the Curtiss-Airports Corporation, Ohio Terminals, Inc., and Curtiss Flying Service, brought into the federal court a year ago, was recently settled by Federal Judge George P. Hahn, who established a precedent by fixing 500-feet as the minimum altitude which must be maintained over suburban districts in order not to trespass on the estates of the property owners. The case has attracted widespread attention, and because of the decision will undoubtedly be quoted in court many times in the future.

"However, the decision applies only to the case at hand. While Judge Hahn ruled that under the conditions presented 500-feet was the minimum, he also stated that under different conditions 600-feet or even higher could be ruled as the minimum height."

CIVIL AVIATION DEVELOPMENTS

By Major C. C. Turner A.F.R.Ae.S.

Much as one is tempted to dwell upon striking achievement and immediate profit, it is very necessary at this early stage in the evolution of civil flying to look deeper, and to consider tendencies in design and their promise of future consolidation. Special design for a spectacular triumph, as the winning of a big prize, is not to be despised, for it plays a part in the general advance, but those who imagine that this is the beginning and end of aviation take an essentially cynical view: well-founded faith sees and works for the commercial vindication of aviation.

The European Tour.

Take the European contest for light aeroplanes. The German success was due to the attention given in German designs to point-winning luxury qualities rather than to speed and reliability. It was, also, partly due to the fitting of brakes on light undercarriages, which would not have satisfied official British requirements. In the arduous touring test British machines led, and none would say that this was due to luck rather than to merit. Miss Winifred Spooner, whose "Moth" was not fitted with brakes—and it was regrettable that the "Moths" lacked this important accessory—made a brilliant effort in the take-off and landing tests, displaying a specialized skill which, however, should not be demanded from the average pilot-owner, and in the final result she was placed first after the German leaders. Of course, the competition has not established a type of aircraft which will hold the market even for two or three years; and at this stage it is difficult to see how any such competition could do this. It concerned certain categories of light aeroplane, from which such types as the "Puss Moth" and the Desoutter were excluded, these being slightly heavier than the competition limit.

Meanwhile the success of these two machines continues, and is unaffected by the result of the European contest. The "Puss Moth" finds favour wherever it is flown, and the air-braking effected in it by turning the undercarriage struts broadside to the wind for the glide in to land steepens the gradient without increase of speed, a desirable quality even in a machine flown by a highly skilled pilot. The Prince of Wales, whose interest in flying is based on sheer love

of it, and who, despite his multifarious pressing duties, has acquired no mean piloting skill, was one of the first to buy a "Puss Moth," which besides being a luxury aeroplane has a remarkably good performance, carrying fuel for more than 700 miles.

THE "WESSEX."

Keeping to the text of these remarks, attention is due to two British types which are achieving solid rather than spectacular success, and are playing their part in the steady increase of British aviation exports. Of these two machines one, the Westland "Wessex," has on its merits won the distinction of adoption by the Belgian Government for operation on the air lines of the Congo. The "Wessex" and the Avro VI belong to a class in the practical development of which Great Britain has taken the lead, namely, the three-engined aeroplane of low aggregate power. In both the initial difficulty of securing with three low-power engines a reasonable margin of lift for commercial load has been overcome, whilst the security afforded by three engines for operations in regions where forced landings entail more than ordinary risks and expense is an outstanding claim for consideration. The "Wessex" is a high-wing monoplane developed from the Westland IV Limousine, and it accommodates five passengers and pilot and navigator. It is fitted with three Armstrong Siddeley "Genet Majors" of 103 h.p. Its top speed is 115 m.p.h., and its cruising speed is 95 m.p.h. Thus, it is as fast as the big air liners. With full load it can fly with any one of its three engines idle. In its construction and fittings the designers have incorporated several minor features making it suitable for tropical countries, whilst its passengers have an exceptionally good view. Monsieur Cocquyt, of the Sabena, the premier air line operating in Belgium and the Congo, took over the first of the six machines on July 2nd, and after tests flew it to Belgium. Three more have since been delivered.

The Avro VI is a new Avro design incorporating a Fokker type of wing. It affords more head-room than the Avro V, to which it bears a slight resemblance, and accommodates two pilots side-by-side and four passengers. It differs from the "V" in that the outboard engines are on the leading edge of the wing, a resistance-reducing arrangement which bears fruit in increased speed. With its three Armstrong Siddeley "Genet" engines the "VI" has a maximum speed of 121 m.p.h. and a cruising speed of 100 m.p.h., a range of 750 miles, and a service ceiling of 13,000 feet. Steel tubing enters largely into the construction. The designers of this type, like those of the "Wessex" already referred to, have displayed a real appreciation of immediately prospective flying developments by giving attention to a class of machine which is evidently needed in many

parts of the world where the conditions are totally unlike those of Europe, where the commercial opportunity for aircraft, although great, is affected by a very different range of costs and revenue, and where pioneer work carried out now will bear rich fruit at a later stage.

British Flying Boats.

Outside the scope of prize competitions at the present time, again, the big flying boat is a class making sounder progress in Great Britain than in any other country. Convincing evidence of this is to be found in the French Government order for Short "Calcuttas" fitted with three "Jupiter" engines. The French are strongly ruled by national considerations in matters of this kind, and this order is, therefore, highly significant. Naturally, arrangements had to be made to build it in France, and this is now being done under an arrangement between Messrs. Short Bros. and the Bréguet Co.

The "Calcutta" is one of four types of flying boat designed first of all to Air Ministry specifications for the Service. The other three are by Blackburn, Supermarine, and Saunders-Roe. The Blackburn, Saunders-Roe, and "Calcutta" are biplanes; the new Supermarine "Southampton" is a monoplane. In this country the development of the Service flying boat has to some extent stimulated progress with the big passenger carrier, for the makers of these craft are building commercial flying boats with the same wings and power characteristics, but with passenger, instead of military, accommodation. This being the wrong way to set about it, we may be thankful the results are so good; but entirely separate design for commercial purposes ought to be encouraged by the Air Ministry and the air lines, and until this is done commercial flying will remain quite unnecessarily handicapped. The range of these new flying boats will be about 2,000 miles, so that they will be independent of foreign stations. There is, therefore, some reason for hoping that we may soon reap the advantage of having years ago produced practical flying boats, and with them carrying out many long Empire cruises from which a great mass of operational and constructional data have been built up. It remains inexplicable, and a reproach, that so little has been done so far to develop flying boat lines in an Empire which offers far greater opportunities in this direction than exist elsewhere.

This is all the more deplorable when a little examination so clearly shows that on the construction side British sea aircraft are conspicuously the best, whilst it is difficult to see wherein any of the larger German flying boats are doing so well. British flying boats, built to the exacting requirements of the Air Ministry, are more seaworthy, and carry a relatively greater useful load. One would not go so far as

to say that this is due to our general faithfulness to the biplane, for, as a matter of fact, more than one British maker is now dividing his allegiance, but it must be conceded that, broadly speaking whether of land or of sea aircraft, British machines carry more useful load, and they take-off and alight better.

The German Do-X is still on its trials, and so far it is difficult to see that it offers any definite advantage over smaller craft. After all, the principal argument for great increase in flying boat size was that their enormous hulls would give them power to operate from bigger waves than can be negotiated by smaller machines. But so far from this being the case, it appears that the Do-X, on account of the tremendous speed it must attain before it leaves the water, dare not face the big-wave take-off. The Do-X has now been fitted with twelve Curtiss "Conqueror" engines of 600 h.p., and is, therefore, more highly powered than before, although its load is also greater. It is not claimed that it can cross the Atlantic on one load of fuel; and, of course, this is not the criterion by which to judge heavier-than-air aircraft, for with them short stages mean increased pay-load. At the same time, it is manifest that four British flying boats, each fitted with three 600 h.p. engines, would carry more pay-load than the Do-X, could operate over the open sea, and would be more convenient in operation on a service affording a varying quantity of freight. They would use up a more numerous personnel, but the advantages would outweigh this disadvantage.

Landing in Fog.

Whilst there is nothing new in the method of landing aeroplanes in fog with which experiments have lately been made at Farnborough, it seems that in some details the contrivances employed have been definitely improved; and for this reason the trials are important. A captive balloon above the fog level indicates the position of the aerodrome, and by its attitude the direction of the wind. The aeroplane is fitted with a landing stick, not the primitive contrivance used as long ago as 1918, but a more reliable one. When this touches the ground a red light appears on the dashboard of the machine, informing the pilot when to flatten out. This system, combined with directional wireless, brings nearer the day when airlines will operate quite as regularly in fog as can railway trains and shipping, but the idea that it is the solution of the problem of forced landings at night, or in fog, must not be encouraged. Quite obviously such a contrivance would be highly dangerous if the landing stick gave a false indication of height by striking some object above the level ground. For aerodrome use, however, it has the great advantage of being a cheap alternative to the costly Loth cable, with which experiments have already been made at Farnborough.

London Air Port.

Things are looking up when the Air Ministry and the London County Council together consider the question of a site for an aerodrome in the heart of London. The matter arose out of a desire on the part of the Ministry merely to establish contact with the London authority, and it was not imagined that anything practical was likely to come out of it for a long time to come. General surprise is felt at the sympathy with which the idea has been considered by bodies and people who had not been credited with giving more than a passing thought to aviation. But no sympathy is felt for any project which would have the result of closing a part of Hyde Park or Battersea Park to the public, and it passes comprehension that anyone could have entertained for a moment such an infringement of popular rights. That is the way to make aviation unpopular.

On the other hand, some of the ideas put forward appear to be feasible enough. The big roof over a great railway station, such as Waterloo, since a roof is in any case necessary to a station, would entail a comparatively small charge which could be levied on aviation. The roofing of that vast railway area between Victoria Station and the Thames also is worth considering, but perhaps at the station end it is too narrow to be of use. A different project was first put forward by the present writer in the *Daily Telegraph* and the *Observer*, and fantastic though it may at first appear, he has expert authority for stating that it is feasible, and would not entail a prohibitive cost. This suggestion is for a landing roof over the Thames at a part where the roof could be extended a few yards over each bank. The roof, or wide bridge, could be as long as needed, but it ought not to be far west of Westminster. It would be supported on piers, and would have to be high enough for barges and river steamers to pass through, and of course would be lighted for their passage. Revenue would be derived from offices and shops which would be erected with it.

The Airship Situation.

So lavish were the promises when R 100 and R 101 were building, it is not surprising to find expressions of disappointment on all sides now that it is clearly seen that neither ship can carry more than a score passengers, or so, on an Empire flight. It must be admitted, too, that on the official side more emphasis is now laid on the experimental character of these airships than at the time they were laid down, or on subsequent occasions when Ministers conducted parties of visitors to Cardington, and the Airship Guarantee Co. received notabilities at Howden. R 100 has proved an unlucky ship in many ways. Her fabric has given continual trouble, not because of the system of

attaching it, but owing to its exposure under a leaky shed roof during the long period of construction. One or two minor mishaps have had a great effect on the public whose attitude to airships is, to say the least of it, sensitive, expectant, and governed by the "failure complex." R 101 is handicapped by the great weight of her heavy-oil engines, but naturally the public want to know why this was not foreseen. When it was decided to build two airships of 5,000,000 cubic feet capacity airship experts acclaimed the policy as the right one, and declared airships would at last have a chance. But the public now read with amazement that British airship chiefs want bigger and still bigger airships. On the face of it, all this demands uncommon patience and technical understanding from the non-technical public.

The "Graf Zeppelin" meanwhile has been doing the inestimable service of proving that airships can carry a big pay-load, although there are features in the Zeppelin construction which would not pass Air Ministry muster. On the other hand, the Zeppelin uses gaseous fuel, and this has proved so advantageous that people are asking why it was not adopted for our own airships. Actually there was no reason at all; for pioneer experiments had been made in England, and in these Squadron-Leader W. Helmore had taken a big share, as the report of the Aeronautical Research Committee on "Engine Performance with Gaseous Fuels," under his name, shows. Now, after all this time, it is intended to use gaseous fuel in one of our airships, for it is demonstrable that this will increase the range, or in the alternative enable a bigger pay-load to be carried. In the "Graf Zeppelin" the fuel is a trifle heavier than air, but Squadron-Leader Helmore has shown that a mixture not quite so heavy as air can be used, and it is possible this may give even greater advantages. The change over in the case of the R 100 would be easy and inexpensive to effect.

As for the R 101, her Beardmore engines are about to be considerably lightened, but they will still be very heavy as compared with petrol engines, although there will be a net saving taking into account fuel for long journeys. Surely, however, the heavy-oil experiment might well be shelved for the present until an engine of reasonable weight is evolved, meanwhile putting ordinary engines into this airship and equipping her for the use of gaseous fuel. By this means Empire demonstration flights could be proceeded with, useful data compiled, some revenue earned, and quite possibly a power-provider superior both to petrol and heavy oil vindicated and established. If airships are to retain public confidence and win the support necessary for their survival they must be developed practically. It is asking rather a lot from the public to build and maintain two big airships for experiments and nothing else. Meanwhile the Secretary of State for Air has definitely promised a continuance of the great airship experiment.

BOOK REVIEWS

THE REAL WAR, 1914-18. By B. H. LIDDELL HART. (Faber & Faber, Ltd., London. Price 12s. 6d. net.)

Any attempt to compress within 500 pages the story of the war, political, military and naval, is one deserving of success, and we readily admit that the author has achieved success with a striking, instructive and readable book written in a style not dissimilar to that of Mr. Winston Churchill, for whom, in parenthesis, the author expresses consistent admiration. In embarking on this work it has been Captain Liddell Hart's intention to relate the truth without regard to the repute of individuals and to show that the war was waged and decided more in the minds of individuals than in the physical clash of forces; hence the title of his book. His treatment of the subject is in the first two chapters to put the reader in the picture as to the origins of the war and the plans of the opposing sides. The remaining five chapters, one to each year of the war, each open with a brief review of the year and are then divided into scenes, each scene being an impartial examination of the principal events of the year. This system neatly covers the principal theatres of war, but to others it does not lend itself so happily, as for example the campaigns in Mesopotamia and Palestine, to each of which is allotted only one scene—the capture of Baghdad and the Battle of Megiddo. However, as the author himself says, every book worth reading is imperfect—and, whatever imperfections there may be elsewhere, his account of the war on the Western Front and in the Dardanelles more than compensates for the cursory treatment of what were certainly distant and probably indecisive theatres of operation.

In his determination to varnish no reputations we are inclined to think that the author has been a little hard on some of our higher commanders. Marshal Foch, too, does not escape lightly; on the other hand, the growing reputation of the late General Hoffman is still further enhanced. On the whole, we must admit that faults are revealed with stern logic, but we must confess to some surprise when we read that, as late as 1915, Haig was still doubtful as to the value of the machine gun, and that in September, 1916, he used the first batch of immature tanks in an endeavour to stem the growing volume of criticism relative to the conduct of the Battle of the Somme. That the tanks were used prematurely is now unquestionable, but we doubt the motive implied. Is it not more probable that Haig used the tanks at this period, not because he hoped by their agency to retrieve previous failure, but because he attached little importance to them at all? Either was a mistake, but the latter one more in keeping with Haig's character.

It is natural that with one eye we should read from a purely professional point of view and in this connection we agree with the author that it is not possible in a work of the kind under review to relate the action of aircraft in the military sphere, for it formed a thread running

through and vitally influencing the whole course of operations rather than constituting a separate strategic feature. He is certainly correct when he tells us that military appreciation of air values was a slow growth, and the advocates of aircraft had an uphill struggle for recognition. He might have added with advantage that this recognition owed much to the vision of Lord Kitchener and, later, to the sympathy and support which Sir Douglas Haig always extended to General Trenchard. As early as 1914 Lord Kitchener foresaw the necessity for formation flying, and he looked forward to the bombing of Essen as a means of ending the war.

Two small points in the air section are not quite accurate. It was with sixty-three and not with forty-four machines that the Royal Flying Corps crossed the Channel in 1914. Secondly, on page 339, the impression is conveyed that it was the French who introduced the offensive patrol as a method of fighting for air superiority. But in actual fact the decision to employ this method was the result of a series of conferences between General Trenchard and Commandant Du Peutry, commanding the French Corps d'Aviation. The Battle of Verdun merely provided the first opportunity to try out their joint decisions on an active front. Apart from the foregoing, all that Captain Liddell Hart says concerning aircraft and their employment is incontrovertible; in particular we commend to the reader's attention the brief conclusions on page 343. We might add that, if judged by the section on which we are best qualified to express an opinion, the author's standard of accuracy is exceptionally high, as indeed we would expect it to be.

Captain Liddell Hart's main theme throughout his work is the necessity for surprise in war. True, surprise is a principle of war, but it was one often forgotten in the last war; the measure of its remembrance was the measure of the success of any operation in 1914-18. For this reason alone, apart from many others, the book merits a permanent place in the library of every student of war or, for that matter, of any student of psychology.

CHANGING CONDITIONS OF IMPERIAL DEFENCE. CAPTAIN D. H. COLE. (Sifton Praed & Co., London. Price 6s. 6d. net.)

To the student of military affairs it has long been apparent that there is need for a comprehensive work on the broader aspects of Imperial Defence. Colonel May's excellent book, being pre-war, is out of date; Commander King Hall's is too short. Although Captain Cole's new book is a series of essays on military geography from the imperial point of view, and as such instructive, it does not meet the wider requirements which we believe to exist. On the other hand, the author realizes this and says so; moreover, it makes the reader think and brings home to him the necessity for special study of our peculiar defence problems. The danger in attempting to cover a subject of this nature within the space of 180 pages is that there follows of necessity a tendency to treat certain aspects too briefly, and so conveying a false impression. An example in point is the devotion of but two pages to "Freedom of the Seas," with the result that the case for high belligerent rights is not so clearly expressed as it ought to be. There is a useful chapter on sea power in the Mediterranean which sets out the Italian attitude clearly

and logically, but we are inclined to think that the argument ought to have been concluded with some reference to the legal aspect of submarine and air attack on merchant shipping. The section dealing with naval equality has to some extent been overtaken by the decisions of the recent London Conference, but on the whole the British attitude on the cruiser question is convincingly and simply expressed. Here and there are inaccuracies which shake the confidence of the reader; for example, the inference that Imperial Airways changed the route to Egypt because of the flying-boat disaster last autumn, whereas it was the attitude of Italy which brought about the change. Again, the Suez-Cairo road, an excellent one, is described as a mere camel track.

But the most remarkable feature of the book is the omission of any reference to the influence of aircraft on problems of Imperial Defence. True, there is a brief but able section dealing with the development of civil air routes, but what, after the acceptance of a one-power standard at sea, is the most remarkable change in our condition if it is not the use of air power? We do not believe that we are being narrow-minded when we say that no work can cover the subject embraced in the title "Imperial Defence" which does not examine this new feature, and, in particular, the position of England in relation to air attack. Nevertheless, Captain Cole's book is one which we recommend to the study of candidates for the Staff College; it is clear, it is readable, and it is mentally as well as actually instructive. Its principal fault is its brevity.

THE AIR ANNUAL OF THE BRITISH EMPIRE, Vol. II, 1930. (Gale & Polden, 21s. net.)

To home and overseas developments in aviation is now devoted a volume which, for interest in letterpress and illustration, and for comprehensiveness as a review of progress, is of surpassing excellence.

This is the second issue of the "Air Annual," a work of reference founded and edited by an acknowledged authority in the person of Squadron-Leader C. G. Burge, O.B.E., A.R.Ae.S.I., and published at 21s. by Gale & Polden, Ltd., 2, Amen Corner, London, E.C.4. It is encouraging to have the opinion of the Editor that "throughout the Empire the desire is now keen to co-operate towards the establishment of Imperial air communications." Lord Thomson, Secretary of State for Air, in a foreword to this volume, points out that the British Empire will derive greater benefits from the air than any other nation. In the Empire Aviation section aspects of such primary importance as "Economics of Air Transport," "The Influence of Aviation on International Relations," and "Air Transport in the British Empire" are covered by well-informed writers. Airship design and handling are dealt with in another section, while the variety of articles under Sporting Flying (including one on gliding) gives this part of the volume a strong appeal to the amateur aviator. Service and civil aviation each receive adequate treatment, other parts of the volume being devoted to air survey, British aircraft construction, British aero engines, and various classes of accessories and flying equipment. Illustrations in photogravure and monochrome, two three-colour plates, and other plates and maps impart a high artistic quality to the volume as well as added interest and information.

ROYAL AIR FORCE SPORT

Fixtures, October-December, Inclusive

Fri.	Oct.	10	Swimming	Inter-Service Championships, at Halton.
Sat.	„	11		
Sun.	„	12		
Sat.	Nov.	8	Hockey ...	R.A.F. " A " *v.* Tulse Hill " II ", at Stanmore.
Sat.	„	15	Hockey ...	R.A.F. *v.* Wimbledon, at Wimbledon.
Thurs.	„	20	Hockey ...	R.A.F. *v.* Lincolnshire, at home.
Sat.	„	22	R.A.F. *v.* Beckenham, at Beckenham.	
Mon.	Dec.	1	Squash Rackets	R.A.F. Championships at Queen's Club (provisional).
Tues.	„	2		
Wed.	„	3		
Wed.	„	3	Hockey ...	First Round Open Tournament.
Sat.	„	6	Hockey ...	R.A.F. " A " *v.* Tulse Hill " II," at Kent House.
Wed.	„	10	Hockey ...	First Round Junior Tournament.
Thurs.	„	18	Squash Rackets	Inter-Service Championships, at Army and Navy Club.
Fri.	„	19		
Sat.	„	20		
Wed.	„	31	Hockey ...	Second Round Open Tournament.

R.A.F. Athletic Championships, 1930

INDIVIDUAL RESULTS.

Event.				*Distance or Time.*
100 Yards	1st	L.A.C. T. W. Elliott ...	Catterick ...	10 2-10 s.
	2nd	Sergt. D. I. Coote ...	Upavon ...	
	3rd	Cpl. G. Moffatt	Halton ...	
220 Yards	1st	L.A.C. T. W. Elliott ...	Catterick ...	23 5-10 s.
	2nd	A.C. A. H. Thrower ...	Grantham ...	
	3rd	L.A.C. R. A. McIntosh...	Digby ...	
440 Yards	1st	Cpl. J. W. Henley ...	Henlow ...	51 6-10 s.
	2nd	A.C. L. Evans	M. Heath ...	
	3rd	A.C. F. G. Hill	Uxbridge ...	
880 Yards	1st	A.C. G. Brown	M. Heath ...	2 m. 2 4-10 s.
	2nd	L.A.C. G. T. Bassett ...	Old Sarum ...	
	3rd	L.A.C. J. A. Green ...	Old Sarum ...	
One Mile Individual ...	1st	L.A.C. R. H. Thomas ...	Henlow ...	4 m. 20 1-5 s.
	2nd	A.C. G. Brown	M. Heath ...	
	3rd	L.A.C. G. T. Bassett ...	Old Sarum ...	
Three Miles Individual	1st	A.C. C. H. Lang ...	Upavon ...	15 m. 14 6-10 s.
	2nd	Cpl. S. Ferris	Uxbridge ...	
	3rd	A.C. G. S. Moore ...	Hendon ...	
120 Yards Hurdles ...	1st	L.A.C. D. O. Finlay ...	Tangmere ...	15 7-10 s.
	2nd	F./Offr. P. C. Jordan ...	Gosport ...	
	3rd	P./Offr. G. R. White ...	Digby ...	

Event.				*Distance or Time.*
Putting-the-Shot ...	1st	F./Offr. B. Knox ...	Eastchurch	38 ft. 5½ ins.
	2nd	F./Offr. T. Hope ...	Tangmere ...	
	3rd	Cpl. R. F. Hyles ...	Henlow ...	
Long Jump	1st	F./Offr. G. R. White ...	Digby ...	22 ft. 2½ ins.
	2nd	Sergt. D. I. Coote ...	Upavon ...	
	3rd	L.A.C. D. O. Finlay ...	Tangmere ...	
High Jump	1st	P./Offr. H. Simmons ...	Sealand ...	6 ft.
	2nd	F./Lieut. F. F. Nuttall	Digby ...	
	3rd	L.A.C. D. O. Finlay ...	Tangmere ...	
Two Miles Walk ...	1st	A.C. P. Murfitt	Manston ...	16 m. 42 s.
	2nd	A.C. E. J. Peters ...	Gosport ...	
	3rd	L.A.C. E. H. Chalmers	W. Drayton	
Pole Jump	1st	L.A.C. E. Rook ...	Sealand ...	10 ft. 1 in.
	2nd	A.C. C. Boyd	Donibristle	9 ft. 9 in.
	3rd	Cpl. A. May	Gosport ...	
Throwing the Javelin	1st	Cpl. R. F. Eyles ...	Henlow ...	162 ft. 3 ins.
	2nd	A.C. E. Neale	Gosport ...	
	3rd	A.C. B. Ray	Henlow ...	

TEAM CHAMPIONSHIPS RESULT, 1930.

Event.	*Winners (Open).*	*Runners-up.*	*Distance or Time.*
440 Yards Relay	Halton	Henlow	46 3-10 s.
One Mile Relay	Cranwell	Henlow	3 m. 34 9-10 s.
Two Miles Relay	Halton	Henlow	8 m. 40 9-10 s.
One Mile Team	Uxbridge	Henlow	4 m. 38 3-5 s.
Three Miles Team	Uxbridge	Halton	—
360 Yards Hurdles	Halton	Uxbridge	52 5-10 s.
High Jump	Halton	Uxbridge	15 ft. 7¾ ins.
Long Jump	Uxbridge	Halton	60 ft. 10 ins.
Putting-the-Shot	Henlow	Halton	102 ft. 1 in.
Tug-of-War	Cranwell	Uxbridge	

JUNIOR TEAMS.

440 Yards Relay	Gosport	Netheravon	46 9-10 s.
One Mile Relay	Sealand	Netheravon	3 m. 37 1-10 s.
Two Miles Relay	Old Sarum	Sealand	8 m. 42 2-10 s.
One Mile Team	Sealand	Shrewsbury	4 m. 39 s.
Three Miles Team	Digby	Shrewsbury	—
360 Yards Hurdles	Tangmere	Sealand	51 1-10 s.
High Jump	Digby	Sealand	11 ft. 3½ ins.
Long Jump	Digby	Upavon	43 ft. 0½ ins.
Putting-the-Shot	Tangmere	Sealand	71 ft. 0¾ ins.
Tug-of-War	Felixstowe	Andover	—

TOTAL POINTS OBTAINED.

Halton	47	Sealand	36	Andover	15	Worthy Down	3½
Uxbridge	45	Digby	34	Shrewsbury	13	Bicester	3
Henlow	44	Upavon	22	Felixstowe	13	Grantham	1
Cranwell	34	Tangmere	19	Old Sarum	6	Netheravon	11½
Manston	22	Gosport	18	Calshot	5		

Winners, H.M. King's Cup : Halton.
Winners, Air Council Cup : Sealand.
Winners, A.D.G.B. Cup : Upavon.

ATHLETICS : INTER-SERVICE CHAMPIONSHIP.

Held at Portsmouth on Wednesday, July 30th. Result :—1, Army (25 points) ; 2, Royal Navy (18 points) ; 3, Royal Air Force (17 points).

R.A.F. Cricket Association

SIR J. CAHN'S XI *v.* THE ADASTRIANS. At Nottingham, May 12th and 13th, 1930. Resulted in a draw. Sir J. Cahn's XI: 1st Innings, 314; . Adastrians: 1st Innings, 52. Rain prevented further play.

ROYAL AIR FORCE *v.* THE FROGS. May 30th and 31st, 1930. Resulted in a win for The Frogs. Scores:—The Frogs: 1st Innings, 175; 2nd Innings, 137. Royal Air Force: 1st Innings, 181; 2nd Innings, 110.

ADASTRIANS *v.* THE FROGS. At Halton, June 1st, 1930. Resulted in a draw. Scores:—The Frogs, 226 for 2 wickets (declared) (G. R. Walker 79, G. L. Parke 85). Adastrians, 97 for 9 wickets.

THE ADASTRIANS *v.* STAFF COLLEGE. At Camberley, June 4th, 1930. Resulted in a win for the Adastrians. Scores:—Staff College, 81; Adastrians, 131 for 7 wickets (declared).

ROYAL AIR FORCE *v.* INCOGNITI. June 6th and 7th, 1930. Resulted in a win for the R.A.F. Scores:—R.A.F.: 1st Innings, 185 (Sqdn.-Ldr. Fulljames 76); 2nd Innings, 299 for 6 wickets (declared) (P./Offr. Hudleston 87). Incogniti: 1st Innings, 175; 2nd Innings, 135.

ADASTRIANS *v.* R.A.F. COLLEGE. At Cranwell, June 20th and 21st, 1930. Resulted in a win for the Adastrians. Scores:—R.A.F. College: 1st Innings, 133; 2nd Innings, 185 (D. R. Bader 67). Adastrians: 1st Innings, 301 (P./Offr. Hudleston 115); 2nd Innings, 36 for 3 wickets.

ROYAL AIR FORCE *v.* THE ARMY. At The Oval. July 5th, 7th and 8th, 1930. Resulted in a win for the Army. Scores:—Royal Air Force: 1st Innings, 118; 2nd Innings, 336 (W./C. C. H. Blount, 110). The Army: 1st Innings, 302 (Lieut. L. Willians, 107); 2nd Innings, 156 for 4 wickets.

ADASTRIANS *v.* ALDERSHOT COMMAND. At Aldershot, July 11th and 12th, 1930. Resulted in a win for Aldershot Command. Scores:—Adastrians: 1st Innings, 358 (P./Offr. Hudleston 103, L.A.C. Bates 101); 2nd Innings, 156. Aldershot Command: 1st Innings, 492 (Lieut. H. P. Miles, 166); 2nd Innings, 23 for no wicket.

ADASTRIANS *v.* SIR J. CAHN'S XI. At Halton, July 14th and 15th, 1930. Resulted in a win for Sir J. Cahn's XI. Scores: Adastrians: 1st Innings, 150 (F./Lieut. Adams, 54); 2nd Innings, 76. Sir J. Cahn's XI: 1st Innings, 290 (T. Nicholas, 134).

ROYAL AIR FORCE *v.* CIVIL SERVICE. At Chiswick, July 24-25th, 1930. Resulted in a win for the R.A.F. Scores: —R.A.F.: 1st Innings, 304 (F./Lieut. Holmes, 127); 2nd Innings, 153 for 4 wickets (L.A.C. Bates, 59). Civil Service: 1st Innings, 170; 2nd Innings, 275.

ROYAL AIR FORCE *v.* ROYAL ARTILLERY. At Bulford, on August 1st, 1930. Resulted in a win for the Royal Artillery. Scores:—Royal Artillery: 1st Innings, 148; 2nd Innings: 263. Royal Air Force: 1st Innings, 126; 2nd Innings, 133.

ROYAL AIR FORCE *v.* THE FREE FORESTERS. At Camberley, August 8th, 1930. Resulted in a win for the Royal Air Force. Scores:—Free Foresters: 1st Innings, 329; 2nd Innings, 52. Royal Air Force: 1st Innings, 216; 2nd Innings, 168 for 8 wickets (F./Offr. Hudleston 94).

ROYAL AIR FORCE *v.* ROYAL NAVY AND ROYAL MARINES. At Chatham, August 11th, 1930. Resulted in a drawn game. Scores:—Royal Navy and Royal Marines: 1st Innings, 373; 2nd Innings, 157. Royal Air Force: 1st Innings, 500 (Sqdn.-Ldr. B. Baker 152, F./Lieut. A. Holmes 88, and F./Lieut. V. Croome 88).

R.A.F. Lawn Tennis Championships

The Royal Air Force Championships were played at Wimbledon for the first time, but unfortunately the weather was none too good and the Committee had to resort to the use of hard courts as well as grass.

No new "stars" were brought into the limelight, and Wing-Commander H. J. F. Hunter won the singles for the third time, Wing-Commander R. E. Saul again being the runner-up. Hunter and Saul retained the Doubles Championship.

The Inter-Station Doubles Championship was won by Wing-Commander Hunter and Flying-Officer L. V. Hirst, and the Plate Singles by Flying-Officer F. G. Downing.

AIRMEN'S LAWN TENNIS CHAMPIONSHIPS.

The Open Singles was again won by F./Sergt. Twelves. Inter-Station Doubles by F./Sergt. Twelves and Kerby of Halton, and the Plate by F./Sergt. Connell of R.A.F., Cranwell.

The weather during the Championships was wet most of the time, and the result was that nearly all events were played on hard courts, except the final, which was played on grass.

The standard of play generally showed improvement over last year, but there was no player of outstanding ability or up to the R.A.F. Championship standard.

The entries this year were slightly larger than the previous year.

The addition of the Plate was welcomed by all the Airmen, and this should encourage more entries next year.

INTER-SERVICE LAWN TENNIS CHAMPIONSHIPS.

Played at Wimbledon on Monday and Tuesday, August 4th and 5th. Result :—1, Army (12 matches) ; 2, Royal Navy (5) ; 3, Royal Air Force (0). One match left unplayed owing to rain.

R.A.F. Rifle Association

TENTH ANNUAL MEETING, BISLEY.

The following are the principal results :—

1. Tyro Championship.

1. *A.C.1 H. Herring, M.A.E.E., Felixstowe (" Longcroft " Cup, R.A.F.R.A. Silver Medal and £2) 109
2. Sergt. S. Muir, A. & A.E.E., Martlesham Heath (R.A.F.R.A. Bronze Medal and £1) 103
3. L.A.C. A. Scotland, A. & A.E.E., Martlesham Heath (15s.) 101

* Five points over last year's winner.

2. Young Airmen's Championship.

1. F./Offr. R. Harston, S. of A.C., Old Sarum (" Whitelock " Cup, R.A.F.R.A. Small Silver Medal and £2) 159
2. L.A.C. Carpenter, S., No. 5. F.T.S., Sealand (R.A.F.R.A. Small Bronze Medal and £1 10s.) 157
3. Cpl. C. Sexton, H.A.D., Henlow (£1)... 156

3. Rifle Championship—1st Stage.

Match 1.
1. Cpl. H. Tyson, Manston (£2) 47
2. F./Lieut. C. J. Hatcher, M.A.E.E., Felixstowe (£1 10s.) ... 47
3. Sergt. A. Foreman, No. 3 F.T.S., Grantham (£1) 46

Match 2.
1. Cpl. G. Sanders, Manston (£2) 46
2. F./Offr. R. Harston, S. of A.C., Old Sarum (£1 10s.) 44
3. Cpl. C. Willott, A. & G.S., Eastchurch, and A.C.1 H. Herring, M.A.E.E., Felixstowe (17s. 6d. each) 44

Match 3.
1. Cpl. P. Spooner, Manston (£2) 45
2. F./Sergt. A. Worden, C.F.S., Wittering, and F./Offr. H. Hayter, Cranwell (£1 5s. each) 43

Match 4.
1. F./Lieut. C. J. Hatcher, M.A.E.E., Felixstowe (" Burge " Snapshooting Cup, R.A.F.R.A. Small Silver Medal and £2) 48
2. Sqdn.-Ldr. S. Benson, Andover (Small Bronze Medal and £1 10s.) 48
3. L.A.C. J. Holloway, Base, Calshot (£1) 48

4. Winner of 1st Stage.

1. F./Sergt. A. Worden, C.F.S., Wittering ("Grant-Dalton" Cup, R.A.F.R.A. Small Silver Medal) 168
2. Cpl. C. Willott, A. & G.S., Eastchurch (R.A.F.R.A. Small Bronze Medal) 168

5. R.A.F. Rifle Championship and Grand Aggregate.

1. *Cpl. C. Willott, A. & G.S., Eastchurch (The "Duke of Sutherland" Challenge Cup, R.A.F.R.A. Large Silver Medal and £5)... 340
2. F./Lieut. C. W. Hill, H.A.D., Henlow (N.R.A. Silver Medal, R.A.F.R.A. Large Bronze Medal and £3) 329
3. F./Sergt. A. Worden, C.F.S., Wittering (£2) 324
4. L.A.C. W. Hall, Cranwell (£1) 319
5. F./Lieut. E. R. C. Hobson, Air Ministry (£1) 316
6. Sergt. J. Goude, Base, Gosport (£1) 315
7. F./Sergt. J. Burton, A. & G.S., Eastchurch (£1) 315
8. F./Lieut. G. H. Stainforth (£1) 314

* Nine points over last year's winner.

6. Revolver Championship—1st Stage.

Winner: *Cpl. C. Willott, A. & G.S., Eastchurch (R.A.F.R.A. Small Bronze Medal) 268

* Five points over last year's winner.

7. Revolver Championship—2nd Stage.

1. *†F./Lieut. C. W. Hill, H.A.D., Henlow ("Barton" Cup, R.A.F.R.A. Large Silver Medal and £3) 179
2. F./Lieut. G. H. Stainforth, Uxbridge (R.A.F.R.A. Large Bronze Medal and £2) 177
3. F./Sergt. A. Worden, C.F.S., Wittering (£1) 176

* Four points over last year's winner. † Third year in succession.

8. Pistol Championship.

1. *Cpl. C. Willott, A. & G.S., Eastchurch ("F. C. Halahan" Cup, N.R.A. Bronze Medal, R.A.F.R.A. Large Silver Medal and £3) 67
2. F./Sergt. A. Worden, C.F.S., Wittering (R.A.F.R.A. Large Bronze Medal and £2) 67
3. Sergt. J. Clark, No. 1 F.T.S., Netheravon (£1) 62

* Ten points over last year's winners.

9. Pistol Team Championship.

1. *No. 1 Flying Training School, R.A.F., Netheravon ("Salmond" Cup, R.A.F.R.A. Large Silver Medal and 4 Small Medals) 209
2. Armament and Gunnery School, Eastchurch (R.A.F.R.A. Large Bronze Medal and 4 Small Bronze Medals) 204
3. Central Flying School, Wittering 199

* Ten points over last year's winners.

10. Miniature Rifle (Winter) League, 1929-30.

Winners: R.A.F. College, Cranwell (Team captain: F./Sergt. H. Toxtevin) (The Nobel Cup and 10 Silver Medals) 1,545

Runners-up: Home Aircraft Depot, Henlow (Team captain: Sqdn.-Ldr. J. Kemper) (10 Bronze Medals) 1,526

3rd: No. 10 (B) Squadron, Upper Heyford (10 Bronze Medals, having made the highest score in the first stage) 1,531

Winner of the Society of Miniature Rifle Club's Silver Medal: Wing-Comdr. A. T. Whitelock, No. 10 (B) Squadron, Upper Heyford (having made the highest individual score in the first stage of the Miniature Rifle League) ... ... 99·5 over 7 matches.

11. APPRENTICES' MATCH.

1. " B " Squadron, No. 4 Wing, R.A.F., Halton (The " Bonham-Carter " Cup and 4 R.A.F.R.A. Small Silver Medals) 334
2. " A " Squadron, No. 1 Wing, Halton (4 R.A.F.R.A. Small Bronze Medals) 325
3. " B " Squadron, No. 1 Wing, Halton 317

12. THE SQUADRON MATCH.

1. *No. 12 (Bomber) Squadron, R.A.F., Andover (" Brooke-Popham-Steel " Cup, R.A.F.R.A. Large Silver Medal and 4 Small Silver Medals) ... 584
2. No. 502 (Ulster) (Bomber) Squadron, R.A.F., Aldergrove (R.A.F.R.A. Large Bronze Medal and 4 R.A.F.R.A. Small Bronze Medals) ... 578
3. No. 1 (Fighter) Squadron, R.A.F., Tangmere 524

* Sixty-nine points over last year's winners.

13. THE STATION TEAM MATCH.

1. R.A.F. Station, Andover (The " Trenchard " Cup, R.A.F.R.A. Large Silver Medal and 8 R.A.F.R.A. Small Silver Medals) 1,182
2. Home Aircraft Depot, R.A.F., Henlow (R.A.F.R.A. Large Bronze Medal and 8 R.A.F.R.A. Small Bronze Medals) 1,157
3. Royal Air Force, Halton Camp 1,132

14. THE COMMAND CUP.

1. Inland Area (R.A.F.R.A. Command Cup, Replica of same and 9 R.A.F.R.A. Small Silver Medals) 1,203
2. R.A.F., Iraq (9 R.A.F.R.A. Small Bronze Medals) 1,120
3. Coastal Area 1,111

15. RIFLE XX MATCH.

1. A.C.1 D. H. Paul, A. & G.S., Eastchurch (" J. C. Halahan " Cup, R.A.F.R.A. Large Silver Medal and £3) 140
2. Sergt. D. Edwards, Base, Gosport (R.A.F.R.A. Large Bronze Medal and £2) 140
3. F./Offr. H. H. Ellison, No. 502 Squadron, Aldergrove (£1) 139

16. UNIVERSITY AIR SQUADRONS MATCH.

1. Oxford University Air Squadron (4 R.A.F.R.A. Small Silver Medals) ... 541
2. Cambridge University Air Squadron 499

17. RETIRED MEMBERS' MATCH.

1. Sqdn.-Ldr. J. L. K. Pearce (R.A.F.R.A. Small Silver Medal and £1 10s.) 142
2. Lieut. R. Riley (R.A.F.R.A. Small Bronze Medal and £1) 139
3. Cpl. F. A. Reynolds (10s.) 139

18. RETIRED *v.* SERVING MEMBERS MATCH.

1. Retired Members 1,087
2. Serving Members 1,076

19. R.A.F. (1,094) *v.* CIVIL SERVICE (1,096).

PRIZE-GIVING.

The Chairman (Group-Capt. Peel Ross) :—

" Air Chief Marshal Sir John Salmond,—On behalf of the R.A.F. Rifle Association, I do wish to thank you for coming down to-day to present our prizes at the Tenth Annual Meeting of the Association. I think we are particularly honoured in that during your first year of office as Chief of the Air Staff you have been able to make time to do this.

" I also wish to thank the other senior officers who have come down to see the shooting. The result of it will undoubtedly show itself next year and in the years to come. It does help very much.

" This year we have been favoured with brilliant weather, which has not actually made the shooting very much easier. Some lights have been rather difficult, and the mirage has been difficult. However, I am glad to report that the shooting has been better than in any previous year. Several individual matches and team competitions have created records. For example, out of many good shots, Cpl. Willott, who won the Championship, made a score of 340. This is a record for the shoot and is the second time he has won this prize. He has also won the Pistol Championship with a record score. A.C.1 Herring won the Tyro with a record score in his first year.

" The one discouraging aspect concerns the teams to represent the squadrons. We do appreciate that it is a difficult time for teams to get away, and also that squadrons are badly situated for practice. I do feel that every effort does not appear to have been made to facilitate teams being sent to this meeting. Apart from this one exception, units and commands have been extremely well represented. In the Command Cup every command entered a team except Malta, and it shows that the interests of the Association spread a long way. We had a letter from Kai Tak recently and hear that they have formed a unit of the R.A.F. Rifle Association and are doing well.

" The discipline of all ranks has been exemplary. We have had no trouble whatever. Everybody has played the game as we expect them to do.

" I wish to thank Sqdn.-Ldr. Pearce, F./Lieut. Cullen and F./Lieut. Dark for the help and experience they have given us. Everything has run extremely smoothly. The pistol ammunition ran so smoothly that we had none left for the Pistol Championship.

" I would like to emphasize that we do not regard rifle shooting as a sport so much as training the individual in accuracy, and in this connection we hope that the R.A.F. Rifle Association may add a small point to the general efficiency of the Royal Air Force."

The Chief of the Air Staff, after the presentation of the prizes, said :—" We have just heard Group-Capt. Peel Ross' report which is very satisfactory and I would like to say that on the first occasion of his chairmanship of the Association we feel that he is a good substitute for the old chairman, Air Vice-Marshal Halahan.

" Group-Capt. Ross has mentioned the large number of records created this year, and I do think that you are to be congratulated on that, and I wish particularly to mention those who have made the records. I do hope that this is a promise of coming out on top in the Inter-Services Meeting later on.

" Cpl. Willott will probably need my car to get home with all his prizes, if he has not got one of his own. I also want to mention A.C.1 Herring and F./Lieut. Hill.

" I should like to say how pleased I am to see the Apprentices taking part in this meeting. This is the first time they have been down and I hear that the scores have been very satisfactory under the difficult conditions. I would like to remind these Apprentices that among the ex-Apprentices are some of the most promising shots in the Royal Air Force.

" The Chairman mentioned the entries this year. As a point of interest there have been 400 per cent. more than at the first meeting ten years ago, but are about the same as for the last three years. In particular, I would like to mention the shortage of squadron teams, and I hope that Officers Commanding Squadrons not taking part will make every effort to see that their squadrons are represented.

" We must not forget that we have all had a good time and thank those who have worked and those who have helped to make this meeting a success. Firstly, those who have been marking for you. People have not disputed the results put up on the targets and I think this is to the credit of the markers. They have the reputation of being the best markers at past N.R.A. meetings and they have well upheld that reputation. Our thanks are also due to the retired officers who have willingly come again and again to help us and to such good effect, the chief among them being Sqdn.-Ldr. Pearce and with him F./Lieut. Cullen and F./Lieut. Dark. Last but not least, are the members of the Committee of the National Rifle Association and the Secretary, Major Etches.

" I wish to draw everybody's attention yet again to the record score of 340 made by Cpl. Willott."

MINIATURE RIFLE LEAGUE FOR THE NOBEL CUP, SILVER AND BRONZE MEDALS.

The first fixtures of the above league in the 1st Stage will commence in the first week in October. Entrance fee : 7s. 6d. per team.

Royal Air Force Swimming Championships

RECORDS BROKEN

Several new R.A.F. records were established at the R.A.F. Swimming Association's Championship Meeting which concluded at the Bathing Pool, Clifton Baths, Margate. The meeting had been spread over four evenings and ample arrangements had been made for a large crowd of spectators. The inclement weather on Wednesday and Thursday evenings, when the bulk of the heats were contested, greatly marred the attendance, but the conditions were considerably better on the last two evenings.

No less than five existing records were broken, viz.: 100 Yards Back Stroke, 220 Yards Free Style, 100 Yards Breast Stroke, Plunging and 440 Yards Free Style, three of them falling to the credit of A.C. Barnsley, of Uxbridge, whose splendid performances in the events in which he figured were a notable feature of the meeting. He had some keen struggles with A.C. Letchford, of Manston, but generally proved himself a stronger swimmer and fully deserved his successes. In the 100 Yards Free Style Barnsley's time equalled the existing record, which was established in a swimming bath, and but for a collision between him and another competitor it is probable that a new record would have been made in this event also.

In the Water Polo, Manston struggled gamely to retain the championship, but were beaten by Uxbridge by the odd goal in three.

The Inter-Unit Challenge Cup was also won by Uxbridge with 49 points, Halton being second with 47 and Manston third with 21. The points scored by the other units were :—Henlow, 14½; Cranwell, 14; Ruislip, 9½; Duxford, 5; Gosport, 4; Sealand, 4; Kenley, 2; Wittering, 2; and Shrewsbury, 1.

On the first three evenings the band of the Royal Air Force (Manston) played selections, whilst on Saturday evening an added attraction was provided by the Pipers and Drums of the 603rd City of Edinburgh (Bomber Auxiliary Squadron).

The cups and medals were presented to the winners and runners-up by Mrs. C. L. Lambe, wife of Air Vice-Marshal Lambe, C.B., C.M.G., D.S.O., the President of the Association, who was the recipient of a bouquet, and Wing-Commander R. J. Mounsey expressed the thanks of the Association to Mr. Iles for the arrangements made at the bathing pool, and to F./Lieut. Noel Keeble, D.S.C., D.F.C., for his efficient work as Secretary and Treasurer of the Association.

RESULTS.

100 *Yards Back Stroke.*—1, A.C. Greenwood (Uxbridge); 2, P./Offr. Brackenbury (Duxford); 3, A.C. Letchford (Manston); 4, Cpl. Stacey (Halton); 5, A.A. Winden (Halton). F./Offr. Constantine (Cranwell) was disqualified. Time: 1 min. 22 1-5 secs.

Greenwood swam strongly and won by three yards; close struggle for second place.

100 *Yards Free Style.*—1, A.C. Barnsley (Uxbridge); 2, L.A.A. Upham (Halton); 3, F./Offr. Letchworth (Sealand); 4, A.C. Robertson (Henlow); 5, A.C. Chappell (Uxbridge); 6, A.C. Donald (Manston). Time: 1 min. 6 1-5 secs., which equalled the R.A.F. record made in a swimming bath and not in sea water.

A very close finish. Barnsley, who led throughout, collided with a competitor swimming in the opposite direction, but just managed to touch the rope in front of Upham.

Tug-of-War.—Halton beat Digby in the first round and Calshot in the final.

Diving, "Low Board" and "High Board."—1, A.A. Feaks (Halton); 2, A.A. Watson (Halton); 3, A.A. Smith (Cranwell); 4, A.A. Dixson (Cranwell); 5, A.C. Finley (Uxbridge); 6, P./Offr. Collins (Uxbridge).

Canoe Race.—1, Calshot; 2, Wittering; 3, Ruislip.

220 *Yards Free Style.*—1, A.C. Barnsley (Uxbridge); 2, A.C. Letchford (Manston); 3, A.C. Bridge (Uxbridge); 4, A.C. Stuman (Halton); 5, A.A. Campbell (Halton); 6, A.C. Still (Henlow). Time: 2 min. 55 1-5 secs., which broke the existing R.A.F. record of 2 min. 58 secs.

Although Letchford led at the end of the first lap, Barnsley overhauled him and forged ahead and won by a dozen yards, the same distance between second and third.

Greasy Pole.—1, A.C. Udal (Farnborough); 2, A.A. Tate (Cranwell); 3, A.C. Wrightson (Farnborough).

100 *Yards Breast Stroke*.—1, A.A. Haines (Cranwell); 2, (dead heat) A.P.P. Todd (Ruislip) and A.C. Bisley (Henlow); 4, A.A. Knowles (Halton); 5, A.C. Bradshaw (Manston); 6, L.A.C. Belcher (Shrewsbury). Time: 1 min. 23 secs., which broke the R.A.F. record of 1 min. 24 4-5 secs., equalled by the second pair.

Todd led most of the distance, but lost " ground " at the final turn and Haines won by two yards from Todd and Bisley, who finished simultaneously.

Cock Fighting (Comedy Item).—1, A.C. Wrightson (Farnborough); 2, A.A.Tate (Cranwell).

Inter-Unit Relay Race.—1, Halton (L.A.A. Upham, A.A. Campbell, A.A. Winden and A.A. Stuman); 2, Uxbridge (A.C. Greenwood, A.C. Bridge, A.C. Chappell and A.C. Barnsley); 3, Gosport (F./Lieut. Harrison, Sergt. Pegg, A.C. Cocks and A.C. Candy); 4, Henlow (Wing-Cmdr. Mounsey, Sergt. Harper, A.C. Lidstone and A.C. Robertson); 5, Kenley (L.A.C. Thornton, A.C. White, Cpl. Whiting and F./Offr. Holland); 6, Wittering (A.C. Harper, L.A.C. Plested, A.C. Wallis and A.C. Stockdale). Times: Halton, 3 min. 33 secs.; Uxbridge, 3 mins. 35 2-5 secs.; Gosport, 3 mins. 40 secs.

Plunging.—1, F./Lieut. Smylie, D.S.C. (Halton), 62 ft. 9 ins.; 2, Cpl. McLaren (Ruislip), 61 ft. 3 ins.; 3, Sergt. Grimes (Uxbridge), 54 ft. 6 ins.; 4, Wing-Cmdr. Mounsey (Henlow), 49 ft. 6 ins.; 5, F./Lieut. Richards (Manston), 49 ft.; 6, L.A.C. Thompson (Wittering), 48 ft. 2 ins. Previous record, 60 ft. 5¼ ins.

440 *Yards Free Style*.—1, A.C. Barnsley (Uxbridge); 2, A.C. Letchford (Manston); 3, L.A.A. Hugged (Halton); 4, A.C. Greenwood (Uxbridge); 5, A.A. Arden (Halton); 6, A.C. Bullmore (Cranwell). The times of A.C. Barnsley and A.C. Letchford were 6 mins. 33 secs. and 6 mins. 33 1-5th secs. respectively, which broke the Royal Air Force record of 6 mins. 42 secs.

Barnsley and Letchford led the competitors throughout the race and it was obvious it was going to be a close struggle between these two for the honours. At the last turn the Uxbridge swimmer led by a few strokes, and Letchford, swimming magnificently, almost overhauled him when he encountered a swimmer going in the opposite direction and they clasped each other round the neck. This, unfortunately, cost Letchford the race as Barnsley touched the rope a fifth of a second in front of him.

Water Polo.—The final was contested between Manston (who beat Shrewsbury in the semi-final by 6 goals to 0) and Uxbridge (who had qualified by beating Henlow by 9 goals to 2).

It was an exciting match, but Manston, who held the Water Polo Championship, were beaten by 2 goals to 1. Uxbridge scored the first goal after one of the Manston swimmers had been temporarily ordered out of the water, and in the second half Letchford equalized for Manston after one of the Uxbridge players had been similarly penalized. A keen struggle ensued for the winning goal, and two other swimmers, one from each side, were ordered out for fouls. The Manston team lost Letchford, who was seized with cramp, and Barnsley netted the point which gave the Uxbridge men the victory.

ARTICLES OF AERONAUTICAL INTEREST APPEARING IN CONTEMPORARIES.

"THE ARMY QUARTERLY."

July, 1930. *Vol. XX, No.* 2.

Military Prize Essay, 1930. "Captain Bertrand Stewart's Bequest." By Major B. C. Dening, M.C., R.E.

"Mechanization and the Desert." By Major Lionel Dimmock, R.A.

"CANADIAN DEFENCE QUARTERLY."

July, 1930. *Vol. VII, No.* 4.

"The Evolution of the Rigid Airship." By Group-Captain E. W. Stedman, O.B.E., M.E.I.C., R.C.A.F.

"THE FIGHTING FORCES."

July, 1930. *Vol. VII, No.* 2.

"The Question of Air Control." By the Editor.

"JOURNAL OF THE ROYAL UNITED SERVICE INSTITUTION."

August, 1930. *Vol. LXXV, No.* 498.

"The Co-ordination of the Fighting Services." By Wing-Commander Sir Norman R. A. D. Leslie, Bart., C.M.G., C.B.E., p.s.a., R.A.F.

Second Prize Essay (Air) for 1929. By Brigadier-General H. Rowan-Robinson, C.M.G., D.S.O.

"The Influence of Aircraft on Sea Power" (Lecture). By Commander Sir Dennistoun Burney, Bart., C.M.G., R.N.

"Aircraft Carriers or Flying Boats." By Commander G. C. E. Hampden, R.N.

"THE ENGINEER."

July 4th, 1930.

"Air Cooled Aero Engines." By A. H. R. Fedden.

August 1st, 1930.

"An Aero Engine Testing Plant."

August 15th, 1930.

"The Commercial Possibilities of the Airship."

September 5th, 1930.

"Oil-paved Runways for Air Ports." (Reprint of an article in *Canadian Engineer*.)

"THE TIMES TRADE AND ENGINEERING SUPPLEMENT."

June 21st, 1930.

"Air Power." Lessons of the R.A.F. Display.

"New Aircraft."

August 16th, 1930.

"Progress of Air Mails—International Co-operation Essential."

"Air Survey—The Nistri System."

R.A.F. UNIT CRESTS AND MOTTOES

Key No.

13. No. 7 (Bomber) Squadron: "Per Diem Per Noctem."
14. No. 8 (Bomber) Squadron: "Usquam et Passim."
15. No. 9 (Bomber) Squadron: "Per Noctem Volamus."
16. No. 13 (Army Co-operation) Squadron.
17. No. 14 (Bomber) Squadron.
18. No. 23 (Fighter) Squadron: "Semper Aggressus."
19. No. 504 (County of Nottingham) (Bomber) Squadron.
20. No. 605 (County of Warwick) (Bomber) Squadron.
21. No. 503 (County of Lincoln) (Bomber) Squadron.
22. Royal Aircraft Establishment.
23. H.M. Airship R.100.
24. Observer Corps.

Note.—For further particulars see Notices on page xlvii of the July, 1930, issue, and also p. iii of this issue.

CORRESPONDENCE

To the Editor of "The R.A.F. Quarterly."

DEAR SIR, *July* 10*th*, 1930.

Having written nine books, I am too old a hand to fall into the novice's error of trying to review my reviewer, and I write to you now only because some words used in the notice of my "Air Power and the Cities" in your July issue may give a false impression of the whole nature and scope of the book. The reviewer states that in my treatment of the subject I show myself "too much of a lawyer." But, then, the subject *is* law—international law. That is the subject and the sole subject, and it does not cease, of course, to be the subject—the real or main subject—because in dealing with it one has to deal, incidentally, with such side-issues as principles of strategy or doctrines of war. The treatment is legal because the subject is legal. I must emphasize this point, which is not clearly brought out in the review, because it is fundamental, and to fail to grasp it is to fail to get to the core of the book. The book is, first, last, and all the time, a book about *international law*. I do not wish it to sail under false colours, and therefore I should be much obliged if this letter could be given publicity.

But I am grateful to the reviewer for commending the book to the R.A.F. That is all that matters in my mind when I write a book—that it should be of some use, from the *legal* side, to the R.A.F.

Yours faithfully,

J. M. SPAIGHT.

[We agree with the author that the reviewer's comments might create a false impression as to the fundamental purpose of this book. But we leave it to readers to decide for themselves as to whether the reviewer's comments on the principles of strategy or doctrine of war are or are not justified. If, as seems likely, this little controversy should lead to a more careful and detailed study of the book, then the reviewer will have achieved his purpose, and the author a more thorough reward for his labours.—ED.]

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UNPOSTED LETTERS
No. 1.

The Secretary,
Air Ministry,
Adastral House,
Kingsway,
London, W.C.2.

DRESS—OFFICERS.

Sir,

1. I have the honour to refer to the regulations governing the mode of wearing the embroidered birds on the shoulder-straps of mess kit.

2. In brief, these regulations lay down that the birds shall be facing to the rear of the wearer.

3. The symbolical allusion of this is not quite clear, but may possibly be intended to represent the apprehensive rearward glances of the pilot during active operations—

(*a*) To see what his observer is doing, if anything,
or (*b*) To see whether an enemy is diving on his tail.

4. In an older service this arrangement might be taken to symbolize a careful regard for the traditions of the service and a lively interest in past history, but this restricted outlook cannot be considered as symbolical of a new and progressive service. It neither agrees with the motto of the service—" Per Ardua ad Astra "—nor with those of the two colleges which are moulding the Royal Air Force of the future—" Superna Petimus " of the Royal Air Force College and " Visu et Nisu " of the R.A.F. Staff College.

5. I therefore suggest that the dress regulations relating to this item should be amended so that one bird faces forward and one bird to the rear, symbolizing the application of the lessons of the past to the problems of the future and an unrestricted outlook on any subject affecting the Royal Air Force.

I have the honour to be,

Sir,

Your obedient servant.

13.VIII.30.

THE ROYAL AIR FORCE QUARTERLY, VOL. I.

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